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THE GRADUATE SCHOOL

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CHAPEL HILL, N. C.

CALENDAR

1922

June 11-14	*Sunday to Wednesday.* Commencement.
June 12-*August* 18	Summer Law School.
June 20-*August* 4	Summer School.
September 26-27	*Tuesday and Wednesday.* Registration for Fall Quarter.
September 28	*Thursday.* Fall Quarter begins.
September 30	*Saturday.* General meeting of the Graduate School, 8 P. M.
October 6	*Friday.* Last day for approval of applications for degree of Ph.D. at Commencement of 1922.
October 11	*Wednesday.* University Day.
November 22	*Wednesday.* Thanksgiving Recess begins (1:30). P. M.).
November 28	*Tuesday.* Thanksgiving Recess ends (8:30 A. M.)
December 21	*Thursday.* Applications for admission to candidacy for Master's degree at Commencement of 1922 must be approved by this date. Last day for approval of thesis subjects for Master's degree at Commencement of 1922.
December 21	*Thursday.* Fall Quarter ends. Christmas Recess begins (1:30).

1923

January 2-3	*Tuesday and Wednesday.* Registration for Winter Quarter.
January 4	*Thursday.* Winter Quarter begins.
March 21	*Wednesday.* Winter Quarter ends.
March 22	*Thursday.* Spring Quarter begins.
April 12	*Thursday.* Easter Recess begins (4:30 P. M.).
April 19	*Thursday.* Easter Recess ends (8:30 A. M.).
April 28	*Saturday.* Last day of period for written examinations for degree of Master of Arts.
May 2	*Wednesday.* Last day for submitting theses for degree of Ph.D.
May 12	*Saturday.* Master's theses must be submitted. Written examination for the degree of Ph.D. may not be taken after this date.
June 4-8	Final Examinations.
June 10	*Sunday.* Baccalaureate Sermon.
June 12	*Tuesday.* Alumni Day. Meeting of the Board of Trustees.
June 13	*Wednesday.* Commencement Day. Summer Vacation begins.

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†Absent on leave *Winter Quarter*, 1921-1922.

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THE UNIVERSITY AND THE ADVANCEMENT OF LEARNING

The duty of the University not only to teach but to add to the sum of learning is implicit in a clause in the first constitution of North Carolina, adopted in December, 1776, in which it was stated that "all useful learning shall be duly encouraged, and promoted in one or more universities." The charter of the University was granted in 1789, and the cornerstone of the first building, now called Old East, was laid October 12, 1793. It was ordered that the first professorship, founded January 10, 1794, was to be held by a teacher who should be "Presiding Professor" of the University with the title of "Professor of Humanity." But from the first scientific studies were emphasized as well as the humanities, one of the acts of the trustees in December of 1792 being a provision for the purchase of apparatus for experimental physics and for astronomy. At the time of the formal opening, set for January 15, 1795, a library was also established, made up of books donated by residents of the State, the number of volumes in each gift ranging from three to thirty-two, the total reaching nearly a hundred volumes. In 1797 the library received by gifts its first "collection," consisting of 174 volumes of French works. In early times organizations of students made it part of their work to develop the library facilities of the University. The literary societies, founded in 1795, had their own collections of books, and from these beginnings the general library of the University developed.

If the beginnings of such research work as could be carried on only through the aid of proper library facilities were small, the impulse on the scientific side was surprisingly active. As early as 1817 the University published a geological survey of North Carolina that is said to be the first report of the kind in the United States. One of the most distinguished scientists of his time, Elisha Mitchell (1793-1857), was a professor in the University for many years. He published several text-books on geology and mineralogy, and many articles in the *American Journal of Science*. Other members of the faculty during the first seventy-five years of the University's history were authors

of text-books and scientific articles in their departments of learning. Laboratory resources were slender; experiments had to be performed by professors and not by the students, but they were published by twenty-five or more men in the faculty, not including such reports as those issued by the State geologists, who have been for many years members of the University faculty. During this period, also, several research societies were established at the University, and their proceedings have been published in the learned journals maintained by the institution.

Beginnings of Graduate Work

Though the University, like other institutions of its kind, had conferred the master of arts degree as an honorary degree for many years, no formal action was taken towards the establishment of graduate study until 1881. President Battle's report in that year called attention to the fact that the University was maintaining special schools of law, medicine, and pharmacy, and that the academic faculty would furnish post-graduate instruction leading to the degrees of master of arts and doctor of philosophy. These degrees would not be conferred "except upon rigid examination on prescribed courses." The first degrees of master of arts and doctor of philosophy in course were granted in 1883. In 1885 the first Graduate Bulletin was issued, a circular stating the requirements for advanced degrees in constitutional law, political economy, classical languages and literature, English language and literature, French, German, mathematics, chemistry, natural philosophy, and in geology, botany, and zoology.

At about the same time (1883) the impulse to further research at the University gained new strength through the establishment of the Elisha Mitchell Society. For the first three years the society published annual volumes of proceedings; afterwards the *Journal* became a quarterly. From the first the society has stressed original research on the part of professors and advanced students and has been an immense aid to higher scientific work at the University. The Philological Club established an annual record of research, called *Studies in Philology,* in 1906. The *James Sprunt Historical Monographs,* founded in 1899, gave

opportunity for the publication of the results of advanced research in history, particularly in the history of North Carolina.

The establishment of these three learned journals in the fields of science, history, and philology, together with the activities of the research clubs which have held monthly meetings now for many years, afforded a great stimulus to investigation at the University and increased recognition of the importance of graduate work. In 1904 the Graduate Department was formally organized as a distinct school of the University and Professor C. Alphonso Smith was appointed as its first dean.

For more than a century the spirit of investigation has been a very real element in the life of the University, constituting a tradition of rich value from which future work is to derive inspiration and authority. In days of limited equipment, remote from great libraries and laboratories, working under conditions that would have quenched a spirit less vital, members of the University were nevertheless impelled to devote themselves to research. No proper estimate either of the history of the University or of its life today can be made without taking into account the sincerity and worth of this achievement.

Research in the Scientific Department

In zoology the principal lines of investigation have been the embryology and regeneration in sponges, coelenterates, and the lower vertebrates, and the systematic zoology of sponges. The Department of Botany continues in its studies of the flora of the Carolinas, and of the reproduction and physiology of higher fungi and of water-molds. Research is in progress in the School of Medicine on acute and chronic Bright's disease, on the toxicity of anaesthetics and its prevention, and on the influence of age on certain physiological conditions. The Department of Geology has had under investigation the movements of sand dunes, the geology of North Carolina, and the relation of geology to forestry and agriculture. In Chemistry, some of the lines of work are the chemistry of zirconium, dyes and intermediates, utilization of wastes, and discovery of new methods of research. The Department of Mathematics has made contributions to pure mathematics, especially geometry, and to the application of mathematics to engineering problems.

Statements concerning the laboratories and scientific equipment of these departments will be found in connection with the various departmental statements below. The Elisha Mitchell Society is the clearing house for reports of scientific investigations, and various scientific departments maintain departmental clubs for professors and students.

Research in Other Departments

The Department of History has for many years been interested in various aspects of Southern history and has published many books and monographs in this field. With the acquisition, recently, of the Weeks Collection, it now possesses unrivalled facilities for further work in the field. In connection with the State Historical Library at Raleigh, which also publishes a series of valuable monographs and books, the department finds opportunity for both research and publication. In the classics much work has been done in the field of syntax and literary history. At present the department is doing productive work in Roman history and law, and in various aspects of Latin drama and theatrical conditions. The Department of English is best equipped, from the library standpoint, in Old and Middle English and in English literature and literary history of the sixteenth and seventeenth centuries. The special fields of investigation in which the department is at present mainly interested are the Renaissance, Milton, and certain aspects of the eighteenth century.

Journals of Research

Three journals devoted to research in different fields of learning are maintained by the University. *The Elisha Mitchell Journal,* now in its thirty-sixth volume, has published a very large number of scientific papers, particularly in chemistry, botany, and zoology, and is regarded in this country and abroad as one of the most distinguished journals of its kind. The *James Sprunt Historical Monographs,* now in its seventeenth volume, is a series of original papers chiefly on North Carolina history, contributed by professors and advanced students in the Department of History. *Studies in Philology,* now in its eighteenth volume, originally was limited to the publication of research in philology carried on by members of the language departments

at the University. In 1915 it became a quarterly, and now admits to its pages articles by scholars in other universities as well as by members of the University of North Carolina. In April of each year it publishes a series of papers dealing with English literature of the sixteenth and seventeenth centuries, called "Elizabethan Studies," and the journal is now recognized as one of the foremost American journals of philology.

The Library

The general Library of the University contains one hundred thousand volumes, constituting one of the three largest collections in the South. It has been built up with great care, the purpose being to make of it an effective working library, a laboratory for the use of students in those departments in which research must be carried on mainly by means of books, as well as an instrument contributing to general culture. The foundations having been laid, it is expected that the next few years will see great expansion in those departments of the Library which supply the materials for investigation. Already valuable special collections are in the possession of the Library, some of which are mentioned in the various departmental statements below. Notable among these, perhaps, is the Weeks Collection, recently added and now in process of cataloguing. This collection, containing several thousand volumes, constitutes the most complete library of North Carolina history and literature in existence.

There are several departmental libraries, especially for the scientific departments. The Law Library, containing five thousand volumes, is at present placed in the building occupied by the Law School. It contains material useful to students of history and government. Advanced students also have the privilege of using the valuable manuscripts of the State Historical Commission, at Raleigh, with the State Library, both of which are housed in a beautiful and commodious building.

The University Library receives upwards of one thousand periodicals annually. These include all important publications in this country and abroad. The learned journals which record contemporary research in all the great fields of investigation, such as the sciences, history and economics, classical and modern

foreign languages and literatures, and English philology, folklore, and literature, are available. The Library is a member of all important philological, bibliographical, and scientific associations, and receives their publications regularly. Bound volumes of most periodicals of permanent worth are available from the beginnings of their publications, constituting a working collection of great value to advanced students. The Library also receives the publications of such organizations as the Smithsonian and the Carnegie Institutions, and of all universities, including foreign universities, which issue monographs of advanced research.

Graduate students are given, on application, cards of admission to the book stacks, so that they have immediate access to the stores of the Library. There are also in the Library building separate seminar rooms for the departments of history, the classics, romance, Germanic, and English languages and literatures. These seminar rooms are equipped with reference and bibliographical works, with long tables around which the various departmental seminars gather for their meetings, and with individual filing space for advanced students.

Situation and General Advantages

The University is situated at Chapel Hill, ten miles from Durham and twenty-eight miles from Raleigh. It may be reached by rail from University Junction, or by one of the automobile lines which maintain regular and frequent schedules from Durham. The site of the University is on a promontory of granite, belonging to the Laurentian system, about three hundred feet above the sandstone formation to the east that was once the bed of a great body of water. It is near the center of the State, midway between the mountains and the sea, with sufficient elevation to insure healthful and pleasant working conditions. The site has always been famed for its beauty. On this promontory the great roads from Petersburg to Pittsboro and from New Bern to Greensboro crossed. At the cross was a chapel of the Church of England, giving to the eminence its name, New Hope Chapel. The name "Chapel Hill" occurs in the report of the trustees, November, 1792, on the choice of a site, and a contemporary account describes the site as follows:

> The seat of the University is on the summit of a very high ridge. . . . The ridge appears to commence about half a mile directly east of the building, where it rises abruptly several hundred feet. This peak is called Point Prospect. The flat country spreads out below like the ocean, giving an immense hemisphere in which the eye seems lost in the extent of space.

This account is equally valid today. The region abounds in hills, covered with magnificent trees, filled with springs and brooks, and with a profusion of mountain flowers. The campus, of about fifty acres, is one of the most beautiful in America. The University owns, contiguous to the campus, five hundred acres of forest lands, partly laid off in walks and drives. Plans are under way for the development of part of this tract, to be called South Campus, on which new quadrangles are to be erected in the near future.

Several endowed lectureships are maintained by the University. The McNair Lectureship, founded in 1906 by the will of John Calvin McNair of the class of 1849, provides for an annual series of lectures by a visiting scholar of distinction, and for the publication of the lectures in book form. Among the holders of this lectureship in recent years have been: Dr. David Starr Jordan, of Stanford University; Dr. Henry Van Dyke, of Princeton; President Arthur Twining Hadley, of Yale; Professor Francis G. Peabody, of Harvard; Dr. George Edgar Vincent, of Minnesota; Professor John Dewey and Dean Frederick J. E. Woodbridge, of Columbia; Professor Hugh Black, of Union Theological Seminary, and Professor E. G. Conklin, of Princeton University.

The Weil Lectures in American Citizenship, founded by Mr. Sol Weil and Mr. Henry Weil, of Goldsboro, were inaugurated by former President William Howard Taft in 1914-1915. The series for 1915-1916 was given by Professor George B. McClellan, of Princeton, and recent lectures have been given by Mr. James A. Macdonald, of Toronto, and others.

A Southern exchange lectureship is also maintained, by which members of the faculties of Vanderbilt, the University of Virginia, and the University of South Carolina, in annual succession, spend a week at this University during which time they

offer public lectures and meet certain groups of students for intensive study.

In the division of Languages and Literatures a special seminar is offered in each year, under the direction of a distinguished scholar from some other university. The Seminar meets daily for a week, each session continuing for two hours. It is open only to advanced students in the division, who are supplied with a syllabus, and are expected to do some preliminary reading in the subject before the regular sessions begin. This makes possible an intensive study, by a small group, of a subject limited in its scope and conducted under such conditions as to render possible the intimate association of the class-room. Professor J. E. Spingarn, formerly of Columbia University, was the first incumbent on this foundation, his subject being Literary Criticism. Professor Edwin Mims, of Vanderbilt, followed Dr. Spingarn, his subject being National Ideals in American Literature. In 1918-1919 a Seminar in Shakespeare was conducted by Professor Raymond M. Alden, of Stanford University; in 1919-1920, a Seminar in Pre-Shakespearean Drama by Professor John M. Manly, of the University of Chicago, in 1920-1921 a Seminar in Dante by Professor Charles H. Grandgent, of Harvard University, and in 1921-1922 a Seminar in Vergil by Professor E. K. Rand, of Harvard. In 1920-1921 a seminar in the history of the Philippine Islands was conducted by Dr. James A. Robertson, of Washington, D. C., Managing Editor of the *Hispanic-American Historical Review.*

In addition to these special courses and lectureships, there are in each year many single lectures by well-known men. Some of these are of scholarly nature, others are popular. There are many entertainments of various kinds under the direction of the University. Notable among these are the Sunday evening recitals conducted by the Department of Music, the concerts and recitals by various University musical organizations, and the production of dramatic work by the Carolina Playmakers. These plays are written by students in English 31, and are produced by them, under the direction of Professor F. H. Koch, at the Playhouse.

In the various departmental clubs students engaged in work in special fields find opportunity for the discussion of problems of mutual interest. There are also meetings of the Graduate

School from time to time for papers and social intercourse. The Graduate Club, composed of students and members of the Faculty who are interested in research, holds monthly meetings at which papers are presented dealing with research in the various fields of learning and with the method of higher investigation. This organization publishes a Yearbook, summarizing its work, in June of each year.

ORGANIZATION OF THE GRADUATE SCHOOL

Work for advanced degrees in the University of North Carolina is under the supervision of the Graduate Faculty, which consists of those officers of professorial rank who are chiefly interested in the Graduate School, either because they offer courses for graduate students or because of their interest in research. The immediate direction of the Graduate School is in charge of an administrative board, of which the dean is chairman, consisting of ten members of the faculty who represent the three divisions under which the courses offered by the Graduate faculty are listed.

These divisions, with the departments constituting each, are as follows:

I. *The Division of Languages and Literature*
- The Department of English
- The Department of German
- The Department of Greek
- The Department of Latin
- The Department of Romance Languages

II. *The Division of Philosophy and of Political and Social Sciences*
- The Department of Commerce
- The Department of Economics
- The Department of Rural Economics and Sociology
- The Department of Education
- The Department of History and Government
- The Department of Philosophy
- The Department of Sociology and Public Welfare

III. *The Division of Mathematics and the Sciences*
- The Department of Botany
- The Department of Chemistry
- The Department of Civil Engineering
- The Department of Electrical Engineering
- The Department of Geology
- The Department of Mathematics
- The Department of Physics
- The Department of Psychology
- The Department of Zoology

General Purposes of the Graduate School

The Graduate School finds its special work in the following fields.

1. It is interested in carrying on research and in training its members in the method of investigation. The University, as an educational institution, is charged with the duty of gathering and organizing the stores of human knowledge and of converting this knowledge to the uses of today's life. But it is also charged with the duty of adding to the sum of human knowledge and of training investigators in the method by which learning has been advanced.

All the work of the University which relates to this extension of the bounds of knowledge and to this mastery of the method of research comes within the scope of the Graduate School. To foster in every possible way the spirit of inquiry among the members of its staff of instruction is part of its duty, not only because graduate studies can be conducted only by those who are possessed of this spirit, but also because it is by the presence of this spirit, among instructors and students alike, that the University differs from the fitting school. The Graduate School exerts a powerful influence upon undergraduate instruction, and it also seeks to draw into its ranks all young men and women who are capable of becoming trained investigators. All the company of scholars, therefore, whether professors with many learned works to their credit or beginners who have taken some branch of learning to be their province, are co-workers. Their relationship is more intimate than is possible in the undergraduate department.

2. Besides this primary duty of encouraging the spirit of research, of contributing to the sum of knowledge, and of training investigators, the Graduate School must train teachers for secondary schools and colleges. Departmental teaching in these institutions depends, if it is to discharge worthily its function, upon three elements: First, a thorough grasp of the field of learning represented by the department; second, training in the method of the subject, which means its province, its organization, and the discovery of problems and their solution; and third, the relation of the department to the entire field of education and to life. The Graduate School offers to those of its members who expect to become teachers opportunity for the thorough professional training indicated by these requirements. The method of

research will be used not because it is necessary that the departmental teacher be a productive scholar in the technical sense but because it is necessary that he shall be a scholarly man who is able to produce, through his training and character, something of the spirit of scholarship in others.

3. In addition to these two functions which make it a professional school of equal authority with the other professional schools of the University, the Graduate School differs from these other professional schools in that it preserves a unique relation to the undergraduate college of arts and sciences. As a professional school, it trains investigators and teachers. As a continuation of the undergraduate college it supplements and corrects the elementary course.

Many young men and women feel, at the close of their undergraduate course, that they are just ready to begin what might prove their real education. Despite the pressure of modern life, the impulse to go at once into business or to enter upon the course in law or medicine, it is certain that this desire for a year or two more of liberal culture will become increasingly influential with men and women who are conscious of high gifts. Indeed, the very pressure of modern life itself, the increased competition for the prizes of life, will make such further study desirable even from the standpoint of material success. Such students will enter the Graduate School not to become investigators of teachers in special fields but to secure a coördination and summary of their undergraduate course in a way impossible through other means. The task of the undergraduate college is to introduce the student to the great knowledges, or fields of learning. The task is so immense and the handicaps of modern college life are so great that the senior realizes vividly that he has acquired only elements and perhaps a taste for higher study by the time he must leave the college. In the Graduate School, while his purpose will be to concentrate somewhat more rigorously upon one division of learning, he will find greater freedom for reading and individual study, greater opportunity for cultivating some taste to the point of relative mastery, and a clearer view of the relation of learning to life. The ideal, for students of this type, is not the highly specialized work leading to the doctorate,

but a course, and a method of study, planned along the lines of the tradition of the great English universities, Oxford and Cambridge.

The departments and the authorities of the Graduate School of the University of North Carolina will pay particular attention to the needs of the students who are attracted by the possibilities described in this section.

4. Lastly, the Graduate School offers opportunities for certain forms of special training not included under the three preceding classifications. Some of these special trainings are described under the various departmental statements below. The field of community service, in various aspects, is covered, on its practical side, by courses in the Department of Rural Social Science and in the Department of Commerce and Economics; and on the creative side by training in community music and community drama. Courses in higher economics, in business administration, in foreign trade relations, combined with courses in other departments chosen for their contribution to a wider business knowledge and the development of sound business judgment may be planned in such a way as to make the Master's degree worth-while. Other illustrations of the way in which the Graduate School may assist through affording training for special pursuits will occur to anyone. For example, a year's work preparatory to journalism is offered to college graduates. A year's work preparatory to law is offered by the combination of courses in history and government, sociology and economics. The dean of the Graduate School and administrative board will be glad to plan such special courses for any properly qualified candidate who may apply.

ADMISSION AND OTHER INFORMATION

Admission

Holders of bachelor's or master's degrees from standard colleges are admitted to the Graduate School upon presentation of their credentials and without examination. Upon the vote of the Administrative Board other mature persons may be admitted as special students in courses for which they are qualified. Every student must bring to the office of the Graduate School, at the

time for registration, a program of studies approved by the department in which he proposes to specialize, or, in the case of special students, the permission of the department to register for certain specified courses.

Not earlier than the last week of his first quarter of residence, a member of the Graduate School may apply for admission to candidacy for a higher degree. To do this, three steps are necessary. 1. The applicant must file in the dean's office a transcript of his undergraduate record in the departments in which he proposes to do his major and minor work, and in allied departments. 2. The heads of the major and minor departments in which the candidate is working at the University of North Carolina, or their representatives, must certify that the candidate is qualified to carry on such advanced work as may be required for the degree. In case a student lacks certain elementary courses in either the major or the minor department, such courses will be indicated on the departmental certificate, and will become prerequisite courses without graduate credit. 3. A report on the work done by the candidate during the term or terms in which he has been a member of the Graduate School must be filed by the head of the major department or his representative. This report will cover all the work done at the University of North Carolina and will indicate the department's approval of the application for admission to candidacy for a higher degree.

It should be noted that this distinction between admission to the Graduate School and admission to candidacy for a degree does not necessarily involve any extension of the time required for the degree. Properly qualified students will register at once, with the approval of the departments interested, for such advanced courses as they wish to take, and all advanced courses completed according to the rules for graduate work will be credited towards the degree.

Fees and Expenses

The tuition and incidental fees in the Graduate School are the same as in the College of Liberal Arts, thirty dollars each quarter. But under the act of the Legislature adopted in 1887, free tuition is given to candidates for the ministry, to the sons

of ministers, to young men under bodily infirmity, and to teachers in the schools of North Carolina. Young men who agree to teach in North Carolina for at least two years after leaving the University are also exempt from charges for tuition.

A certain number of University scholarships carrying free tuition in the Graduate School, are available. Applications for these scholarships should be filed in the office of the dean not later than April 1st.

University Teaching Fellowships

Twenty-four Teaching Fellowships, each with a stipend of $500, are available to graduate students. These fellowships carry free tuition (not including laboratory fees), and are payable in nine monthly instalments, beginning in October of the year for which they are awarded. Holders of these fellowships are expected to perform certain limited services as teachers or laboratory assistants in the department to which they are assigned. This department must be the major department of graduate study, and each holder of a fellowship will be required to pursue advanced courses in the department during his term as fellow.

Fellowships are awarded only to men who present satisfactory records as students and who give promise of being able to carry on advanced work with distinction. Teaching experience is desirable, but is not required. The time required for the Master's degree may be extended in the case of men who hold fellowships; ordinarily such men will not find it possible to register for more than two-thirds of the full program carried by graduate students.

Correspondence in regard to the teaching fellowships may be addressed to the dean or to the head of the department in which the candidate proposes to do his major work. A special form of application, to be secured from the dean's office, must be filed on or before April 1st. Elections to fellowships will be made by the Administrative Board of the Graduate School, on nomination by the department at which the fellowship is to be assigned.

Rooms and Board

Graduate students may apply for rooms in University dormitories on the terms named in the catalogue. Rooms are also available in the town. Board costs from $21.50 to $30.00 per month.

The University Year

Three terms, or quarters, of approximately eleven weeks each, constitute the regular University year. In addition, a summer session of six weeks extends from the last of June until the first week in August. In all of these terms graduate courses are offered, and students may register at the beginning of any term.

The unit of work is the course, by which is meant, as a rule, a class meeting five times a week. Half courses are also offered. In some courses open only to graduate students, such as the seminars and other research courses, the formal class exercises are modified. But all such work is credited in terms of courses and half courses.

Students are ordinarily expected to register for three courses. But two half courses may be substituted for a full course. Not more than three courses, or fifteen hours of class atttendance, will be permitted. Students of more than one year's standing, candidates for the doctor's degree, are permitted greater latitude with reference to courses for which formal registration is required. Such considerations as the amount of time devoted to research, to work on the doctoral dissertation, and the like, weigh in the estimate of what constitutes full work. But in all such cases detailed reports by the department are required before residence credit is given.

Graduate students who desire credit for attendance at the summer session must register at the office of the dean. The rules respecting admission to candidacy for higher degrees, for selection and approval of courses, and for the higher degrees, are the same in their application to summer session students as in the case of students registered for the regular sessions.

Teachers of experience whose credentials and work are satisfactory to the administrative board may complete the requirements for the master's degree in four summer sessions. Such

students will be expected to continue their studies during the year under direction of the special committee in charge of their work, and may do part of the work required for the thesis in this manner. In certain approved cases, also, a limited amount of credit may be transferred from work done in another university summer school. Every such case is treated individually, and must be approved by the Administrative Board on recommendation of the department, at the time the application is made for admission to candidacy for a higher degree. Students who are not admitted under these special conditions will find five summers necessary for completion of the requirements for the master's degree.

Only work announced as open for graduate credit in this Bulletin of the Bulletin of the summer school session may be counted towards the higher degree.

Work done *in absentia* will not be counted for graduate credit, except that in certain cases approved by the department and by the Administrative Board, part of the work on the thesis for a higher degree may be done elsewhere, and except, further, that part of the work required for the degree of doctor of philosophy, may on recommendation of the major department and with the approval of the administration board, be done at another university. But all such work, even when credited, is subject to examination at the finals required for the degree.

General Regulations

The following regulations of the faculty of the Graduate School should be observed:

1. Graduate students are subject to the same rules regarding attendance upon classes, faithfulness to assigned tasks, examinations and credit as students in other departments of the University. But graduate work usually pre-supposes a greater amount of time for research in the library or the laboratory, and the student, being more mature, is thrown more upon his own responsibility. For these reasons excessive registration is not permitted. The whole idea of graduate work is comprised in a more intense specialization and therefore more complete investigation than is necessary or wise in undergraduate instruction.

2. Grades for each course completed are reported to the Dean and to the Registrar. These grades are as follows:

"1," which represents work of the highest distinction.

"2," which represents work of high distinction.

"3," which represents work that, while satisfactory, is of fair grade only.

No work falling below the standard represented by the grade of "3" is counted for graduate credit. At least half the work credited for anyone year of residence must be of grade "2," or better.

3. Each graduate student works under the direction of a special committee which consists usually of the head of the major department, or of some member of the staff of that department under whom the candidate is doing special work, who serves as chairman, and the other instructors with whom the candidate is registered. At least once in each quarter a report on the quality of all the work done by the candidate is filed by the committee in the dean's office. The program and plan of study proposed by each graduate student will be approved by the committee after conference with the chairman, and by the dean.

The effort is made to arouse in the mind of the student a sense that graduate work is not a matter solely of attendance on classes and passing examinations on courses. He must see his work as a whole, and in its relation to a department of learning, not as a set of isolated units. In the more intimate personal relations to his advisory committee, too, he finds values impossible in the undergraduate course. He is a member of a small group; instruction is more nearly personal; he becomes acquainted with the method as well as with the content of learning. To this end, he makes use of laboratories and libraries as instruments of learning. It should be noted, also, that in order to gain these ends, greater freedom is allowed the graduate student than is proper for undergraduates. On entrance to the Graduate School, the candidate for a higher degree selects the department and even the professor who is to have charge of his studies. His program of work is made out upon consultation with this adviser, and is directed by a special committee con-

sisting of his instructors in both major and minor subjects. The regulations of the administrative board are applicable only to such matters of general policy as look toward a proper concentration of studies in courses sufficiently advanced to be regarded as of graduate grade, and toward a proper standard of quality as evidenced by such tests as the examinations and the thesis.

THE GRADUATE DEGREES

The degrees under the supervision of the Graduate faculty are Master of Arts (A.M.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.).

1. THE DEGREE OF MASTER OF ARTS

Prerequisites

For the degree of master of arts the general prerequisite is the completion of a course leading to the degree of Bachelor of arts in a college or university of standard grade. This course should have included special study in the department in which the graduate degree is sought sufficient in extent to constitute, in the judgment of the department, a proper preparation for the advanced work expected of candidates for the degree. If the undergraduate preparation has been insufficient, departments may prescribe certain preliminary courses before recommending a student for admission to candidacy for a higher degree. Such courses do not count for graduate credit, but become requirements for the degree in addition to the nine courses specified below.

Registration

Nine full courses of advanced character are required for the Master's degree. To complete these courses, at least one full year's residence is required. No course will be counted for the degree unless it appears in this Bulletin or is approved by the administrative board for inclusion in the next Bulletin to be issued by the Graduate School. Such courses are of two classes only: those primarily for graduates, and those open to graduates and advanced undergraduates. Courses of this second class are ordinarily open only to students of at least senior standing.

The Major

Of the nine courses offered by candidates for the degree of master of arts, six must be from one department, recognized as the major. But with the approval of the special advisory committee and of the administrative board closely allied work in another department, where the relationship of this work to the

special plan of study proposed by the candidate is clear, may be accepted as a part of the major. More than six courses in one department may not be counted except under special conditions approved by the administrative board.

The Minor

The remaining three courses, constituting the minor, are to be chosen from a department different from the major. But the relation of the minor to the major must be such as to constitute for the entire program of the candidate a clearly defined relationship. Ordinarily, therefore, the minor must be a department in the same division as the major, but this is not necessary if the requirement for a unified program of work is met. For a tabular view of these divisions and the departments composing them, see the section on Organization, above. In certain cases the administrative board will permit the minor to be in the same department as the major.

Other Requirements

The method of securing admission to candidacy for the degree and the relation of the candidate to his advisory committee are explained above under the heading of General Regulations.

Ordinarily a reading knowledge of at least one modern foreign language is expected of candidates for the master's degree. This knowledge must be tested by a special examination given by the language department, and must be certified to before the student is admitted to candidacy for the degree. But the language requirement may be waived if the major department regards is as unnecessary in a special case.

The Master's Thesis

Besides the completion of advanced courses that constitute a unified plan of study, the fitness of the student for the degree is tested in two ways; by a thesis and by oral and written final examinations. The thesis tests the candidate's knowledge of the method of investigation and his ability to make use of the knowledge he has acquired. The examinations test his knowledge of his special field by directing attention to the field as a whole, as contrasted with the course, which deals with a limited portion of the field.

The subject chosen for the thesis should be approved by the advisory committee and reported to the adminstrative board by the end of the first quarter of residence. No change in subject, or deferring of the time of approval, will be permitted unless at least two quarters of residence intervene between the approval of the subjects and the conferring of the degree, except that, with the permission of the administrative board, the thesis may be completed by a student not in residence who has satisfied the requirements as to courses. For a statement of the conditions under which such permission may be secured, see above under the heading General Regulations.

The subject of the thesis must be connected with the major, must be connected with a course or courses pursued in residence, and may count not to exceed two courses. No thesis will be approved if it is not written in correct and pleasing English or if it is not presented in scholarly form. It must show independent thought both in its recognition of a clearly defined problem and in its method of treatment. It must show the sources of information and a knowledge of the bibliography of the special field.

The thesis must be presented at least one month before the commencement at which the degree is to be conferred, and in triplicate. The first copy must be on paper of prescribed size and quality, and must observe the special rules of form established by the adminstrative board. A copy of the regulations for the form of these may be had on application to the dean's office. A copy of the thesis, when accepted, must be deposited in the University Library. An abstract must be given to the administrative board at the time the thesis is submitted for approval; the abstract, if the thesis is approved and the degree conferred, will be printed in a special bulletin of the Graduate School annually devoted to reports of research.

Examinations

Candidates for the master's degree are required to pass all examinations in courses at the end of each quarter of residence, with the grades specified under the General Regulations above. In addition two special examinations are required. The first of these is a written examination on the field of the major, is

to be set by the student's advisory committee, and must be taken not earlier than the first month of the last quarter of residence. The second examination is oral, covering the entire work of the candidate, both major and minor, with special stress on the thesis and on one other topic to be selected by the candidate. The examination is to be conducted by a special committee appointed by the Dean, consisting as a rule of the student's adviser as chairman and at least four other representatives of the major and minor subjects. Written notice of the time and place for holding this oral examination shall be sent to all officers of professorial rank in the major and minor departments and to the members of the administrative board, and persons so notified may attend the examinations if they so desire.

While these examinations are not as rigid as those required for the doctor's degree, they must satisfy the committee which has charge of them that the candidate possesses such knowledge of his major and minor field as may reasonably be expected, that he can draw upon his knowledge with promptness and accuracy, and that his thinking is not limited to the separate units represented by his courses. Ability to draw conclusions and to express ideas with clearness and precision is a neccessary element. No mere memorizing of facts will serve.

The special committee on theses and on the examinations will report their recommendations to the dean at least one week before the end of the last quarter of residence. If the candidate's record in these respects is satisfactory, and if he has complied with all of the requirements for the degree, the dean will report to the faculty for approval and recommendation to the board of trustees.

Honors

Honors of two grades, "Honors," and "Highest Honors" may be conferred with the degree of master of arts. Recommendations for Honors are made on the basis of the following considerations: 1. The quality of the student's work in the courses pursued in his preparation for the degree. 2. On the thesis, including the style and form in which it is presented, the value of the results, and the quality of thought which it manifests. 3. On the special examinations, written and oral, for the

degree. 4. On supplementary reading or investigation outside of course requirements.

Commencement

Degrees are conferred only at the annual commencement exercises of the University in June. But a candidate may complete his required work, including examination and submission and acceptance of the thesis at the end of any quarter or term. Attendance at the commencement at which the degree is conferred is required unless the candidate is specially excused by the dean and to the president of the University.

SUMMARY OF THE PROVINCE OF THE DEGREE OF MASTER OF ARTS

The rules and conditions governing the degree of master of arts set forth in the preceding paragraphs have certain well defined aims. It is not a research degree in the sense that the candidate is required to make a contribution to knowledge. It is, however, a research degree so far as the individual student is concerned, since he is engaged in a more detailed study of a single field of learning than was possible during his undergraduate course and this detailed study culminates in work upon a single problem, the subject of his thesis, for the solution of which he is required to give attention to the method of advanced study. He is concerned with the materials of learning, and with the organization and interpretation of these materials. The purpose of his study is still liberal, as in the undergraduate course, but he seeks freedom, not in brief and often unrelated sections taken from the entire field of learning, but in more intensive study of a single province. To this end, of securing freedom and liberal training along with the greater confidence that is to be gained only through mastery of a sharply defined field, the greatest possible latitude is permitted in study plans. The object is not to train specialists but to gain a relative mastery of one of the liberal arts. Hence the correlation of courses, the oral and written examinations, and the thesis. Since there are many possible combinations of courses, and since the method of administration provides for personal supervision of a student's work by a special committee, the training for the degree is a useful and needed supplement to the undergraduate course.

The work outlined above can be done in one year by students whose preparation has been good and who devote themselves as fully to this more specialized work as they would in a professional school. But two years are better than one, and will yield correspondingly greater results. Especially is this true for young men and women who desire to prepare for high school and college teaching, but who do not wish to become investigators or specialists. Part of their time may be spent in study of courses and programs, and of methods of instruction applicable to their special subjects. Two years of study of this sort, if put on the right foundation, will give rich results, and for some reasons such a course is more useful than the course which leads to the doctorate. The administrative board will gladly plan work for the degree of master of arts on a two-year basis, and persons who complete such a course with distinction will be specially recommended for teaching positions of the better grade.

2. THE DEGREE OF MASTER OF SCIENCE

Prerequisite

The subjects of major study may be chemistry, civil engineering, electrical engineering, or geology, and the prerequisite courses are the courses leading to the following degrees: B.S. in Chemistry, B.S. in Civil Engineering, B.S. in Electrical Engineering, and B.S. in Geology. Before becoming a candidate for the advanced degree the student must complete the courses leading to the corresponding bachelor's degree as outlined in the general catalogue.

Courses Leading to the Degree of Master of Science

I. MASTER OF SCIENCE IN CHEMISTRY

One of the groups:

Chemistry 127-128-129
Chemistry 177-178-179
Chemistry 197-198-199

Two of the groups:

Chemistry 114-115-116
Chemistry 124-125-126
Chemistry 174-175-176
Chemistry 194-195-196

Three approved courses from one of the following departments:

Electrical Engineering
Geology
Mathematics

II. MASTER OF SCIENCE IN CIVIL ENGINEERING

One of these groups to be selected as a major.

Civil Engineering 100a-100b-100c
Civil Engineering 103a-103b-103c
Civil Engineering 106a-106b-106c
Civil Engineering 107a-107b-107c

Approved courses in the following departments; the arrangement and number of courses to be decided upon after conference with the Department of Civil Engineering:

Mechanical and Electrical Engineering
Chemistry
Geology
Mathematics
Physics

III. MASTER OF SCIENCE IN COMMERCE

Courses to be arranged in consultation with the head of the Department of Commerce.

IV. MASTER OF SCIENCE IN ELECTRICAL ENGINEERING

Electrical Engineering 100-101-102
Electrical Engineering 110-111-112

Three approved courses from one of the following departments:

Civil Engineering
Chemistry
Geology
Physics

V. MASTER OF SCIENCE IN GEOLOGY

Geology 104-105-106
Geology 107-108-109

Three approved courses from one of the following departments:

Chemistry
Civil Engineering
Botany and Zoology

Other Requirements

The requirements regarding modern language, thesis, examinations, committee, residence, and conferring of degrees are the same as for the master of arts.

3. THE DEGREE OF DOCTOR OF PHILOSOPHY

The degree of doctor of philosophy is conferred only upon those who have completed, with high distinction, a period of extended study and investigation in a single field of learning

during which they have gained control of the materials in the chosen field, have mastered the method of advanced study, and have illustrated this method through a dissertation, the result of independent research, which adds to the sum of human knowledge or present results that have enduring value. Neither the accumulation of facts, however great in amount, nor the completion of advanced courses, however numerous, can be substituted for this power of independent investigation and the proofs of its possession. While it is true that a well prepared student of good ability may secure the degree upon the completion of three years' study, it should be understood that this time requirement is wholly secondary to other considerations that will be explained in the following paragraphs.

Admission and Registration

The rules for admission to courses leading to the degree of doctor of philosophy and for registration for courses in the first year of residence are the same as those stated above in the section on the degree of master of arts. The work for the first year is substantially the same as that provided for candidates for the master's degree, and while it is not necessary to take the master's degree it is usually advisable. The provision for choice of major and minor subjects, and for the direction of the student's work by a special committee, are as already set forth under the requirements for the master's degree.

Second and Third Years

Not later than the beginning of the second year's work a tentative program of study must be approved by the special committee and by the administrative board. During the second year this program may consist chiefly of advanced courses in both major and minor fields. The minor should be completed during this year. A reading knowledge of French and German, to be certified by the respective departments, is essential to the work of the second year, and in the case of certain subjects other language requirements may be imposed by the special committee. During the second year, also, work on the dissertation should be begun.

Not earlier than the end of the second year, and at least one

academic year prior to the commencement at which the degree is expected, a preliminary oral examination shall be given by the special advisory committee in charge of the candidate's work plus all members of the staff of the major and minor departments. This examination shall cover all the work of the two years. As a rule, no student will be admitted to candidacy for the doctorate until this examination has been passed.

The work of the third year requires no special registration in courses, though the candidate will find it advisable to attend certain courses as a lecture student. The major portion of the time is to be spent upon the dissertation or upon special laboratory or research work, and in preparation for the final examinations. A portion of the second and third years may be spent in residence at another university. In some departments such residence is required, the university being chosen according to the student's need for special courses in the field of his dissertation, or for the library or laboratory facilities it offers. Instead of another university, work in a large library or in some special laboratory may be substituted at the discretion of the student and his advisory committee.

The Dissertation

The subject chosen for the dissertation must be approved by the committee and by the administrative board not later than the time of the preliminary examinations. But work upon it, such as preliminary bibliography, collection of material, etc., should be begun earlier than this. The dissertation is the fruit of thorough investigation of a definite problem and finds its value in the scholary and workmanlike manner in which it is presented, in its contribution to learning, and in the mental power which it displays. By "contribution to learning" is understood not necessarily the discovery of something previously unknown but the presentation of the results of the investigation of a worth-while problem in such a way as to merit the claim of originality.

The dissertation must be presented, in three typewritten copies, at least six weeks before the commencement at which the candidate expects his degree. It must comply with the rules for form of theses prescribed by the administrative board, and

abstracts must be supplied as under the rules for Masters' theses. A thesis committee, appointed by the dean, shall examine the dissertation, and no dissertation shall be accepted unless it secures the unanimous vote of the committee.

Publication of the dissertation, except by abstract in the Graduate Bulletin, is not required. But the various journals published by the University afford opportunity for such publication, in whole or part.

The Examinations

Reference has already been made to the preliminary examination required for admission to candidacy for the doctorate.

At least four weeks before the end of the period of study a written examination in major subject must be passed by the candidate. This examination, which is conducted under the direction of the major department, may be limited to the courses taken by the candidate, but as a rule it is based upon the entire field of knowledge represented by the major.

The final oral examination must take place at least two weeks before the commencement at which the student is a candidate for the degree. The committee to have charge of this examination is appointed by the dean, and includes the head of the major department or his representative as chairman, with other members of the major and minor departments as assistants. The date and place of the examination shall be publicly announced, and the examination shall be open to any member of the Graduate faculty.

Candidates whose record in courses, examinations, and dissertation is satisfactory will be reported by the dean to the faculty for recommendation to the board of trustees.

Commencement

Attendance at the commencement at which the degree is conferred is required, unless the candidate is excused by the dean and the president of the University.

COURSES OF INSTRUCTION

Only those members of the various departmental staffs who are concerned in graduate instruction are included in the following statements.

DEPARTMENT OF BOTANY

WILLIAM CHAMBERS COKER, Professor.

HENRY ROLAND TOTTEN, Instructor.

For students well prepared in botany, opportunities are open in teaching in the scientific work of the United States government and of state institutions, in special work in various phases of the subject, such as plant breeding with independent institutions. A master's degree in botany should prepare the student for positions in any of these fields. A doctor's degree is open to those who have the opportunity to prepare themselves for the more responsible positions. One teaching fellowship of $500 and two assistantships are open to students prepared to fill them.

Laboratory Equipment

The botanical laboratories are in a well equipped modern building with all the necessary apparatus for the work that is carried on. The library is large and contains a great majority of the important botanical journals as well as thousands of valuable books and reprints. The Arboretum is of much value to students in the study of special problems, and the surrounding country is particularly rich in a great variety of interesting plant life.

The candidate for the degree of master of arts is at first given work requiring individual initiative, and a part of his work during the course consists of original work, with the preparation of his results in the form of a thesis suitable for publication.

Candidates for the degree of doctor of philosophy give most of their attention to the preparation of an advanced thesis and must show distinct ability to handle their subject in an original manner. A part of their work may be done during the summer at biological stations or other institutions, and visits to other libraries may be necessitated for the study of special literature.

Courses for Graduates and Advanced Undergraduates

4-5-6. Special Morphology of the Fungi with special attention to plant diseases, the culture of the lower fungi, and the identification of mushrooms. Lectures with laboratory and field work. Prerequisite, Botany 1. *Triple course. Fall, Winter, and Spring Quarters.* (Credit will be given for any quarter.) Professor COKER and Mr. TOTTEN. These courses may be continued under the same numbers for more than one year as the subject advances, credit being given for each repetition. Laboratory fee $4.00 a quarter.

8. History of Botany. Lectures, readings, and reports. Prerequisite, two courses in botany. *Half Course. Winter Quarter.* Professor COKER.

Courses Primarily for Graduates

107-108-109. Plant Morphology. Advanced work in the embryology and anatomy if plants. The student is required to collect and prepare material for the microscopic study of special problems. Theses. *Triple Course. Fall, Winter and Spring Quarters.* Professor COKER. These courses may be continued under the same number for more than one year as the subject advances, credit being given for each repetition. Laboratory fee, $4.00 a quarter.

110-111-112. Original work, with thesis, under the guidance of the instructor. Professor COKER. This course may cover most of the work of the student for several years, credit being given each year in accordance with the work done. Laboratory fee, $4.00 a quarter.

DEPARTMENT OF CHEMISTRY

JAMES MUNSIE BELL, FRANCIS PRESTON VENABLE, ALVIN SAWYER WHEELER, Professors.

JAMES TALMADGE DOBBINS, FRANK CARL VILBRANDT, Associate Professors.

The student who wishes to make chemistry his profession may later wish to enter one of the following branches of the profession: (1) *Teaching in Schools, Colleges, and Universities.* At present the work leading to the degree of B.S. in Chemistry fulfills the requirements of the state, but there is a strong tendency towards the requirement of the master's degree for the highest grade of teacher's certificate. For teachers in colleges and universities the work leading to the Ph.D. degree should be taken. (2) *For industrial chemists, consulting chemists and chemical experts,* at least the M.S. degree and preferably the Ph.D. should be sought. The courses leading to these degrees provide also thorough training in the allied sciences, physics, geology, mathematics and engineering, thus enabling the student to become an expert adviser for a corporation in developing and supervising its manufacturing plants, or to act as a consulting chemist in special problems. (3) *The National and State Scientific Bureaus* employ large numbers of chemists and are constantly appealing to the universities for nominations to fill new positions. The better of these positions require candidates with the Ph.D. degree. (4) *Research Chemists* are employed by many private manufacturing establishments and by many semi-public research organizations which maintain thoroughly equipped laboratories. In these, investigations are pursued, having for their end the improvement of old methods and the invention of new methods. The number of such laboratories is rapidly increasing and there is now a great demand for highly trained chemists to take charge of these laboratories and to direct their work. The proper training for such a career is the work leading to the Ph.D. degree.

The work of a graduate student who specializes in chemistry consists in large measure in the solution of some research problem. The student learns at first hand the point of view and the methods of research chemists. At the present time a number of lines of investigation are being actively

followed in this laboratory. In inorganic chemistry research is in progress on the compounds of zirconium. In organic chemistry the kelp oils are being studied in coöperation with the National Bureau of Soils. Cymene, a by-product of the wood industry, is being investigated. Work is in progress on juglon, a dye intermediate, and on certain condensation processes of organic chemistry. In physical chemistry the physical constants of the nitrotoluenes are being studied at the request of the National Research Council. The results of all these researches appear as the work proceeds and during recent years numerous articles have been published in the American journals reporting progress in these investigations.

The research experience gained in the graduate years is of inestimable value not only to the student himself but also to the educational institution or to the industry with which he later becomes associated. This is amply verified from the records of the positions held by the graduates of the University. Many have gone into the iron and steel inndustry, a number into the dye industry either as supervisors of plant operation or as directors of chemical research. Others have gone into other industries, such as tobacco, corn products, general chemicals, and fertilizers. Several alumni are now in charge of large research projects at public and semi-public institutions.

The Department of Chemistry occupies a building constructed in 1905 and located in the eastern portion of the campus. There are two stories and a full basement. It contains forty rooms, among which are three lecture rooms, eight general laboratories, four private laboratories, four research laboratories, four laboratories devoted to special work, a fireproof room and a constant temperature room. The building has recently been re-wired, greatly improving the lighting system and providing for laboratory work requiring the electric current.

The Chemical Library and Reading Room contains many complete sets of the important chemical periodicals, many books of reference, and a unique collection of books of historical value and interest, amounting altogether to more than 3,000 volumes. An endownment of $5,000, the generous gift of Mildred Cameron Shepard in memory of her father, Paul Cameron, supplements the general fund for the maintenance of the library.

Fellowships and Scholarships

Ledoux Fellowship. This fellowship, awarded annually, is the gift of Dr. A. R. Ledoux of New York. The amount of the fellowship is $300.

Attention is also called to the teaching fellowships which are open to graduate students who wish to defray a part of their expenses by teaching elementary classes.

Some assistantships are also open to graduate students. The duties of the assistants are the preparation for and supervision of laboratory classes in the larger elementary courses and also the examination of laboratory reports.

Application for these positions should be directed to the Department of Chemistry not later than April 1st of each year.

Graduate Degrees in Chemistry

The course leading to the degree of *M. S. in Chemistry* is open to students who have graduated with the degree of B.S. in Chemistry at the University, and to students who have completed the equivalent of the course as prescribed by the University. The course leading to the degree of M.S. in Chemistry is prescribed by the Graduate faculty and consists of a research in one of the branches, inorganic, organic, analytical or physical chemistry, of two seminar courses of two quarters each in two of those branches, and of two courses of two quarters each to be selected from four departments: Physics, Geology, Electrical Engineering and Mathematics. The general regulations of the Graduate School govern the work for the Ph.D. degree.

Courses of Instruction

For candidates for advanced degrees with a major in some other department and with a minor in chemistry, the following courses only are open: Candidates for the A.M. degree with a major in chemistry must have elected chemistry as a major in the junior and senior years. Prerequisites are therefore: Chemistry 1, 2, 31, 41, 42, 11, 12, 13, 61, 62.

Courses for Graduates and Advanced Undergraduates

11. Industrial Chemistry. The methods and economics of the chemical industries: acids, alkalies, fertilizers, etc. *Fall Quarter.* Professor VILBRANDT.

12. Industrial Chemstry. The methods and economics of the chemical industries: metals and textiles. *Winter Quarter.* Professor VILBRANDT.

13. Chemistry of Foods. Digestion processes; and the composition, preservation, adulteration and industrial production of foods. *Spring Quarter.* Professor VENABLE.

18. History of Chemistry with discussion of the development of chemical theories. *Spring Quarter.* Professor VENABLE.

45. Technical Quantitative Analysis. Fuels and Gas Analysis. *Fall Quarter* Professor VILBRANDT.

46. Technical Quantitative Analysis. Water, fertilizers, iron and steel, cotton products, etc. *Winter Quarter.* Professor VILBRANDT.

62. Organic Chemistry. Carbocyclic Series. *Fall Quarter.* Professor WHEELER.

63. Identification of Pure Organic Compounds. *Spring Quarter.* Professor WHEELER.

64. Advanced Organic Chemistry. Reports on assigned topics with conferences. Library work. *Winter Quarter.* Professor WHEELER.

81. Physical Chemistry. Study of the properties of solids, liquids and gases, and of their relation to chemical constitution. *Winter Quarter.* Professor BELL.

82. Physical Chemistry. The theory of solution. *Spring Quarter.* Professor BELL.

83. Physical Chemistry. The methods of physical chemistry as applied to industrial processes. *Fall Quarter.* Professor BELL.

84. Physical Chemistry. Electrochemistry. *Spring Quarter.* Professor BELL.

Courses Primarily for Graduates

114-115-116. Advanced Technical Chemistry. Seminar Course: readings and discussions of recent advances in technical chemistry. This course extends throughout the year. Professor VILBRANDT.

117-118-119. Research in Industrial Chemistry. The statements made in regard to courses 127, 128, 129 apply also to this course. Professor VILBRANDT.

124-125-126. Advanced Inorganic Chemistry. Seminar Course: readings and discussions of recent advances in inorganic chemistry. This course extends throughout the year. Professor VENABLE.

127-128-129. Research in Inorganic Chemistry. Laboratory work with frequent conference with the professor and reference to the literature relating to the subject of research. The subject of research must be assigned or approved by the professor. This course extends throughout the year. Professor VENABLE.

Laboratory fee, $10.00 a quarter.

174-175-176. Advanced Organic Chemistry. Seminar Course: reading and discussion of special chapters in organic chemistry. This course extends throughout the year. Professor WHEELER.

177-178-179. Research in Organic Chemistry. The statements made in regard to courses 127, 128, 129 apply also to this course. Professor WHEELER.

194-195-196. Advanced Physical Chemistry. Seminar Course: readings and discussions of recent advances in physical chemistry. This course extends throughout the year. Professor BELL.

197-198-199. Research in Physical Chemistry. The statements made in regard to Course 127-128-129 apply also to this course. Professor BELL.

DEPARTMENT OF CIVIL ENGINEERING

GUSTAVE MAURICE BRAUNE, THOMAS FELIX HICKERSON, Professors.
THORNDIKE SAVILLE, HAROLD FREDERICK JANDA, Associate Professors.

The profession of civil engineering offers rich opportunities to men who have the power to apply their technical knowledge and experience to the best advantage. Graduate technical training based upon a broad scientific and cultural foundation becomes a valuable asset to those who would fill the places of leadership in the profession and the affairs of life.

Instruction is given by means of lectures, recitations, and seminars in connection with appropriate work in the laboratory, drawing room and

field. To this end the civil engineering laboratories in Phillips Hall are being well equipped. A library of text- and-reference-books in Civil Engineering, as well as files of the leading journals, is at the disposal of all the students.

Courses for Graduates and Advanced Undergraduates

5a-b-c. Mechanics. A course in applied mechanics. Comprising statics, kinimatics, and kinetics. The fundamental principles governing the strength and stiffness of beams, columns, truss members, shafting, and the various kinds of riveted work. Professor HICKERSON.

33a-b-c. Hydraulic with laboratory. The principles of the flow of water through orifices, weirs, tubes, nozzles, pipes and open channels, as applied to measurement of water to hydraulic engineering; the fundamental principles of impulse wheels, reaction turbines, and centrifugal pumps. Professor SAVILLE.

14a-b-c. Structures. Graphical and analytical determination of stresses occurring in engineering structures, such as roofs, bridges, retaining walls, etc. The design of simple structures in steel and timber. Professor BRAUNE.

24a-b-c. Reinforced Concrete. The development of the principles involved in the design of slabs, beams, girders, columns, and simple structures. Professor HICKERSON.

34a-b-c. Hydraulic and Sanitary Engineering. Design, construction and operation of water supply and sewerage systems as applied to municipalities and rural communities. Professor SAVILLE.

44a-b-c. Highway Engineering. A detailed study of highway locations, foundations, drainage, width and kind of roads; characteristics of various road materials; highway administration, legislation and organization. Professor JANDA.

15-25-35-45a-b-c. Engineering Design. Application of principles in courses 14, 24, 34, 44, to specific problems in the structural design of roofs, bridges, reinforced concrete and masonry structures; general lay out and design of simple projects for water works and sewerage; physical testing of road materials. Professors BRAUNE, HICKERSON, JANDA and SAVILLE.

Courses Primarily for Graduates

100a-b-c. Hydraulic and Sanitary Engineering. The study and investigation of special problems relating to hydraulics, water power, and sanitary engineering. Professor SAVILLE.

103a-b-c. Structural Engineering. Computation of stresses of statically indetermnate structures. Lectures and design-problems in the drafting room. Professors BRAUNE and HICKERSON.

106a-b-c. Research in Highway Engineering. Investigation of materials in highway engineering through coöperation with the Highway Commission. The research fellow will spend part time at the University and

part time in the field with the Highway Commission. Fellowships will be awarded to worthy graduate students who can present the proper qualifications. Professor JANDA.

107a-b-c. Detailed laboratory study of highway materials. The students will be given problems for investigation that are being constantly suggested in the scientific construction and betterment of highways. Professor JANDA.

DEPARTMENT OF COMMERCE

DUDLEY DEWITT CARROLL, Professor.

CLAUDIUS T. MURCHISON, EARLE E. PEACOCK, WALTER J. MATHERLY, HOMER HOYT, Associate Professors.

The business world is calling for an increasing number of more and more highly specialized experts such as statisticians, research agents, field investigators, financial advisers, personnel managers, commercial agents, etc. The government in connection with its industrial and fiscal operations, the regulation of business, and the consular service, also requires a large number of men who have an understanding of the highly complicated phases of trade and industry. The Department of Commerce provides training for such men.

A library of the most up-to-date business books, reports and pamphlets is constantly being enlarged.

The department offers one degree, that of master of science. A candidate for this degree should devote two-thirds of his time to the courses in commerce, his other courses must be in a closely allied department.

Courses for Graduates and Advanced Undergraduates

16. Banking Practice. Organization and management of a commercial bank. Duties and responsibilities of different departments. Bank accounting. Handling of credit instruments, checks, drafts, acceptances, bills of exchange. Critical examination of present methods and standards. *Half Course. Spring Quarter.* Professor MURCHISON.

10. Business Statistics. Collection, classification, and presentation of business data. Construction of graphs and diagrams. Study of index numbers. How to make a survey of a given business unit, and of business conditions generally. Each student is required to work out a problem involving simple research methods. *Half Course. Fall Quarter.* Professor MURCHISON.

11. Business Cycles. A study of the alternating periods of depression and prosperity. The underlying causes of panics and crises. Fluctuations in prices, trade volume, and physical production. *Half Course. Winter Quarter.* Professor MURCHISON.

14. Foreign Trade. Analysis of American exports and imports. Development of foreign markets. Actual operations in the shipment and financing of export commodities. Managing a foreign trade organization. *Full Course. Spring Quarter.* Professor MURCHISON.

12. Marketing. Methods of marketing raw materials, farm products, and manufactured goods. Sales organization, market analysis, the economics

of advertising, merchandising costs, and prices. *Full Course. Spring Quarter.* Professor MURCHISON.

4-5-6. Advanced Accounting. Study of accounting forms for special types of business concerns, including wholesale houses, department stores, agencies and banking. Accounting for the organization and liquidation of the corporation, for combinations and consolidations, for trustees and receiverships, branch houses, municipalities. Extended study of the principles of valuation and depreciation, the consolidation balance sheet and realization on liquidation. C. P. A. problems. *One and a Half Courses. Fall, Winter and Spring Quarters.* Professor PEACOCK.

7-8. Cost Accounting. Lectures with laboratory work. Methods for collections of data relative to prime costs and careful analysis of various methods of burden distribution. Application of principles will be made in the laboratory by means of budgets for cost accounting in different classes of enterprise. *One Full Course. Fall and Winter Quarters.* Professor PEACOCK. Laboratory fee, $2.00 a quarter.

9. Auditing. Lectures and problems. Kinds of audits, systems of accounts, methods of conducting audits and problems in auditing. *One-half Course. Spring Quarter.* Professor PEACOCK. Laboratory fee, $2.00 a quarter.

4. Business Administration. Employment Management. A critical study of the methods of hiring and handling employees in the various lines of industry. The supply, selection, training, promotion, transfer and discharge of employees; the computation and significance of labor turn-over; housing, educational and recreational facilities; the functions of an employment department with reference to efficiency and the maintenance of good will between employees and employers. *One-half Course. Spring Quarter.* Professor MATHERLY.

6. Business Administration. Investments. A study of the various forms of investments with reference to their suitability for the different types of investors; the money market, its nature and financial factors which influence the price movements of securities; elements of sound investment and methods of computing net earnings, amortization, rights and convertibles. The aim will be to train the student so he will be able to act efficiently in a financial capacity either as a borrower or lender, as investor or trustee, or fiscal agent of a corporation. *One-half Course. Winter Quarter.* Professor MATHERLY.

106-107-108. Seminar. A general introduction to methods of advanced study. Some phase of business activity is selected for consideration in harmony with the interest of the members of the seminar. Methods of work and content receive about equal emphasis. *Three Half Courses.* Professor MURCHISON, chairman.

141. Commerce. Seminar. Individual research in a special field under the direction of a member of the department.

DEPARTMENT OF ECONOMICS

DUDLEY DEWITT CARROLL, Professor.
CLAUDIUS TEMPLE MURCHISON, WALTER JEFFRIES MATHERLY, HOMER HOYT, Associate Professors.

The opportunities open to the student who is trained in economics are numerous: (1) High schools are very generally offering courses in economics. Colleges and normal schools almost without exception have a need for trained teachers of economics. (2) Taxation (state and national) has become so important that there are many calls for trained students to aid the tax-payers and the government. (3) Business has become so complicated in many of its phases that there is coming to be a large need for trained economists as an aid to the business man.

The Department of Economics has the important economic and the financial journals (American and European). It has an adequate supply of books and documents.

The department offers one graduate degree, that of master of arts A candidate for this degree should devote two-thirds of his time to the courses in economics; his other courses must be in a closely allied department.

Courses for Graduates and Advanced Undergraduates

3-4. Money and Banking. A general study of the principles, functions, and forms of money, credit, and banking; a special study of current money, credit, and banking problems. *Double Course. Fall and Winter Quarters.* Professor MURCHISON.

6. Insurance. A general study of the principles and methods of property, social (for industrial wage earners), and life insurance; a special study of life insurance. *Full Course. Spring Quarter. Professor* MATHERLY.

9. Transportation. A general study, from the historical and critical points of view, of railway transportation in such representative countries as Great Britain, France, Germany, and the United States; a special study of passenger and freight traffic and rates; a special study of the state's relation to the railways. *Full Course. Fall Quarter.* Professor———.

10. Labor Problems. A study of labor as a factor in the industrial process; of the wage system and employment problems; of immigration and poverty; of labor organizations, strikes, lockouts, arbitration, factory legislation, and industrial education. *Full course. Winter Quarter.* Professor HOYT.

13-14. Public Finance. A general study of the principles which are involved in the revenues and expenditures of the state, and in the relation of the state to the industries of its citizens; a special study of taxation local, state and national. *Double Course. Winter and Spring Quarters.* Professor CARROLL.

16. Theories of Economic Reform. An analysis of the leading proposals for reform in the present economic system, including Socialism, Bolshevism, Labor Co-partnership, and Industrial Democracy. *Full Course. Fall and Spring Quarters.* Professor CARROLL.

Courses Primarily for Graduates

100-101-102. Advanced Economic Theory. A survey of economic theory from the standpoint of the evolution of modern industrial society. The three courses will not only include a review of the works of the leading economic writers, but it will also summarize the principal physical, psychic and social factors that have shaped economic theory and economic institutions. *Two and a Half Courses.* Professor HOYT.

106-107-108. Economics Seminar. A general introduction to methods of advanced study. Some phase of economic activity is selected for consideration in harmony with the interests of the members of the seminar. Methods of work and content receive about equal emphasis. *Three Half Courses.* Professor MURCHISON, chairman.

141. Seminar. Individual research in a special field under the direction of a member of the department.

DEPARTMENT OF EDUCATION

MARCUS CICERO STEPHENS NOBLE, LESTER ALONZO WILLIAMS, EDGAR WALLACE KNIGHT, JOHN FREDERICK DASHIELL, NATHAN WILSON WALKER, Professors.

Primarily it is the function of the Department of Education to train teachers and administrators for the public schools. It is no less its function to inform students whose primary interest lies in other fields concerning the place and function of the public school as a necessary instrument in a democracy.

As a consequence there are offered in this department three distinct types of courses: (1) those strictly professional in nature; (2) those intended to assist other departments in placing students of those departments as teachers in the public schools of the state; (3) those which are more general and cultural in nature, but presented from the pedagogical viewpoint.

The Department of Education is centralized in the Peabody Building, a gift from the George Peabody Fund, equipped with recitation rooms, offices, laboratories, a reading and seminar room.

It has entered into active coöperation with the local school board by which the elementary and secondary units of the local school system are open for the use of faculty and students in the department.

In like manner the rural schools in Orange County are always available for observation and study by faculty and students. This arrangement includes the Orange County Training School for Negroes, affording

ample opportunity for a study of this rapidly developing project of the State Department of Education.

The University Library contains an excellent collection of text-books on the theory and practice of pedagogy in the fields of principles, methods, and history. Text-books in the subject matter usually taught in the public schools both present and past offer an interesting field of investigation and study. Here also are found current numbers of a score or more of the best educational magazines, the back files of which are being completed as rapidly as possible and several of which are already complete.

The requests for visitation, inspection, and assistance which come to the department from all over the state offer many opportunities for the students in this department to participate in survey and investigative activities which are most interesting and valuable additions to and variance from the investigations demanded as course requirements.

The High School Journal, published eight times a year, offers a medium through which acceptable investigations, studies, and occasional papers of students in the department are put forth in printed form, reprints of which may be secured for a nominal fee. Since this magazine goes to schoolmen in every state and to the libraries and departments of education of practically all the leading colleges, universities, and normal schools, an inducement is thus offered to students in the department to do work acceptable not only to the instructors in the courses but as well to fellow members of the teaching profession.

The Work of the Department of Education

The Department of Education provides teachers, principals and superintendents for elementary and secondary schools in every county in the state.

It conducts teachers' meetings, sends lecturers for educational and community meetings upon request and payment of actual expenses.

Using certain of the standard tests and scales, it has carried on for four years a plan of coöperative research dealing with the measurement of classroom products in more than thirty systems of the state.

It has conducted one city and one county-wide school survey and published the results in bulletin form. It is now engaged in conducting two more similar surveys through the members of its faculty and its students.

Upon request it has advised with school officials upon such matters as the location, specifications and construction of school buildings, the conduct of school bond and special tax campaigns, placement and promotion of teachers and pupils, consolidation of districts, business organization of schools and scores of more detailed problems connected with the public schools.

One member of its faculty has for many years been director of the University Summer School for Teachers, which has grown in number of students from less than a hundred to more than a thousand and has

extended its influence to every corner of the state. Courses of both graduate and undergraduate grade are offered in the Summer School, thus making it possible for teachers in service to earn credits towards either the A.B. or the A.M. degree.

In general the Department of Education strives to interpret and serve the needs of the public schools of the state in so far as its resources will permit.

Courses for Graduates and Advanced Undergraduates

6. The Rural School Curriculum. A brief study of the accepted principles of curriculum-making and of their applicability to the rural school. Attention is given to the basis of selection and organization of the course of study for the rural school; text-books; the relative claims of the traditional subjects and of the modern and special subjects; the administration of the course of study in the small and in the consolidated school; daily programs and schedules. Lectures, readings, special studies and reports. *Spring Quarter.* Professor KNIGHT.

25. History of Secondary Education. The course will attempt to trace great movements in history from the earliest times down to the present in an effort to understand what society and the state have done to help adolescents solve the problems incident to their period of development. The facts of history will be utilized to show how any given civilization or people have been at work on the problem of the education of youth of secondary school age. *Winter Quarter.* Professor WILLIAMS.

26. Public School Education in the South. This course gives a historical survey of public school education in the Southern States with especial attention to its development in organization, administration, and supervision since 1876. Present-day questions in rural education are studied in the light of their historical development, and attention is given to the educational reorganization needed for the proper solution of the new rural life problems. Text-book, lectures, investigations, and reports. *Winter or Spring Quarter.* Professor KNIGHT.

29. American Public Education. A study of the growth of popular education in the United States, of the creation of public sentiment in favor of the education of all the people at public expense and of the gradual realization by the state to the obligation to educate its citizens and how the obligation has been met. *Winter Quarter.* Professor NOBLE.

32. The Rural High School. A study of the outstanding questions in the organization, administration, and supervision of the rural high school in the South. Types of rural high schools, the function of local and of state control, the course of study of the rural high school, federal aid and the influence of the Smith-Hughes Act on rural high school education in the South, and teacher-training courses in the high school, are some of the subjects that will be considered. Lectures, readings, reports. *Spring Quarter.* Professor KNIGHT.

55. Social Policy and Education. Fundamental problems in the social and ethical theory of education. Lectures, prescribed readings, essays, and reports. Open to seniors and graduate students only. This course deals with problems of social progress from the standpoint of education, attempts to define a social policy for education, and discusses the vital educational issues involved in that policy. *Fall Quarter.* Professor and graduate students only. *Winter Quarter.* Professor WALKER.

56. Secondary School Tests and Scales (including Statistical Method). This course plans to give teachers and principals technical skill in the use of statistical method so that they may be able to carry out studies in their own schools. A consideration of group and individual intelligence tests and the evaluation of available tests and scales for measuring achievement in secondary school subjects will complete the work of the course. Lectures, assigned readings, discussion, and laboratory periods. Open to seniors and graduate students only. *Winter Quarter.* Professor WALKER.

62. Educational Measurements. (Elementary course.) The material of the course is the various tests and scales used in the measurement of classroom products as well as the intelligence tests used in conjunction with the subject matter tests in the organization, management and grading of children in school. The methods of giving, scoring, tabulating and interpreting these tests make up the material for class discussion, report and experimentation. *Spring Quarter.* Professor WILLIAMS.

63. Administrative Problems. In this course the more important specific problems having to do with public school administration will be taken up and studied in considerable detail. The amount of time devoted to any one problem will depend largely upon the importance of the bearing of that problem on our local situation. Since the problems to be considered will vary from term to term and from year to year the course may be taken more than once by the same student. *Full Course.* Professor WILLIAMS.

(The class will meet once each week for two hours through the year.)

Attention is also called to Psychology 20 (Educational Psychology) and Psychology 26 (Genetic Psychology).

Courses Primarily for Graduates

101. Problems in Secondary Education. This course is intended for graduate students and is primarily a course in investigation. To be admitted to it a student must have pursued other courses in secondary education. A student who has not taken Education 51 may be admitted only with the special permission of the instructor. At the beginning of the course each student is required to select some one problem for special investigation. The problem for investigation may be chosen by the student but must be subject to the approval of the instructor both as to field and method. A thesis will be required of each student. Throughout the year regular class discussions will be held on various problems in secondary education and assigned readings will be required. *Fall, Winter and Spring Quarters.* Professor WALKER.

102. American Educational Ideals. A comparative study of the educational ideals of church, state, and nation in the United States, and of the gradual extension of the field of educational activity by the state and nation as well as by private and denominational institutions. *Half Course. Winter and Spring Quarters.* Professor NOBLE.

103. The Junior High School. A study in detail will be made of the junior high school, its development, purpose, organization and curriculum. (Strictly of graduate grade; Education 51 or equivalent a prerequisite.) *Half Course. Spring Quarter.* Professor WILLIAMS.

104-105. Educational and Social Statistics (advanced course). The course will consider such topics as educational statistics, the derivation of intelligence and subject-matter tests, the general public and statistical data, the use of tests and scales by supervisors, arrays of social facts, etc. The undergraduate course in educational measurements is a prerequisite. *Half Course. Fall and Winter Quarters.* Professor WILLIAMS.

106. Public Education in the South. This is a strictly graduate and research course in public school education in the Southern States. An exhaustive study will be made of special topics through investigations, reports, and conferences. *Full Course. Spring Quarter.* Professor KNIGHT.

107. The Psychology of Training. An analysis of human training: its nature, means, and possibilities. A reading survey will be made of the outstanding experimental work on these lines. The aim will be to get an accurate and scientific notion of the subject, with applications to education. *Half Course. Spring Quarter.* Professor DASHIELL.

111-112-113. Experimental Educational Psychology. Opportunity will be offered for the experimental investigation of special problems along the line of the individual student's interests. Where necessary, adjustment of the work to the needs of graduate students lacking laboratory training in this field can be made. *Half or Full Course,* 5 or 10 laboratory hours weekly. *Fall, Winter, and Spring Quarters.* Professor DASHIELL.

126. Foundations of Education in the South. In this course the various educational agencies will be studied by texts, lectures, special investigations, reports, and discussions, for the purpose of presenting (a) the development of present educational practices, tasks, and tendencies, and (b) the influence of the dominating economic, political, and social ideals in the evolution of the free common-school system, high schools, institutions of higher education. *Full Course. Fall Quarter.* Professor KNIGHT.

131. Rural School Organization, Administration and Supervision. This is an administrative and professional course and is intended for those persons who are preparing for county superintendencies and rural school supervisory positions. It is both a descriptive and research course in rural life conditions in the South and especially in North Carolina, and consists of lectures, discussions, readings, and individual projects in field work and investigation. *Full Course. Winter Quarter.* Professor KNIGHT.

140. Seminar in Education. (Thesis course.) This course is open only to graduates and is devoted to research in connection with dissertations.

It is intended for those students whose graduate major is in education, but others whose thesis topic is closely related to education are invited to attend and to take part in the discussions. The Professors in the School of Education.

DEPARTMENT OF ELECTRICAL ENGINEERING

PARKER HAYWARD DAGGETT, JOHN HARRIS MUSTARD, JOHN EMERY LEAR, Professors.

The Department of Electrical Engineering offers courses leading to the degree of master of science in electrical engineering. The requirements for the degree are in general the same as for the degree of master of arts and the prescribed courses may be found on page 35. Admission to candidacy for this degree presupposes the completion of the regular four-year course of this University leading to the degree of bachelor of science in electrical engineering. In the case of students from other technical schools of recognized standing certain substitutions may be accepted in lieu of the specific requirements for the bachelor's degree here.

The degree may ordinarily be obtained in one year after the conferring of the bachelor's degree, but in certain cases where the preliminary training of the candidate has been insufficient two years may be necessary.

With the opening of the new laboratories in the Phillips Building the department is able to offer excellent advantages for advanced work in laboratory investigation and engineering design. The laboratories comprise a total of nearly seven thousand square feet of floor space divided into a large dynamo laboratory containing over forty generators, motors and transformers; a standardization laboratory equipped with a wide range of precision standards for both direct and alternating current measurements; a well equipped photometric laboratory; a radio laboratory and a special research laboratory equipped with a complete General Electric oscillograph outfit.

All of these laboratories are supplied with direct and alternating current power by means of a plug and socket system of connections, eight wires running from a large slate switchboard in the main laboratory to sub-panels located conveniently in the smaller rooms. A 120-volt 240-ampere-hour storage battery is available for work where a steady voltage is necessary.

The University Power Plant offers excellent additional facilities for commercial testing and economic study of an advanced nature.

Through the generosity of Captain Isaac Edward Emerson, of Baltimore, the department possesses a very fine library of well-chosen text- and reference-books in both electrical and mechanical engineering, as well as files of the leading electrical engineering journals, American and foreign, some of which are complete to date.

Investigations already undertaken or in contemplation include the end-ring leakage reactance of squirrel-cage induction motors, current wave-

shapes in the three-wire generator, automatic signalling for local battery telephone systems and brush drop phenomena.

Courses for Graduates and Advanced Undergraduates

64a-b-c. Alternating Current Machinery. An analytical study of e.m.f. and current-wave shapes; effect of iron cores; the transformer; the alternator; the synchronous motor, induction motor, repulsion motor; the synchronous converter. The laboratory work will follow closely the classroom study. Prerequisites, Engineering 63a-b-c and Mathematics 4-5-6E, or equivalent. *Eight Hours a Week. Fall, Winter and Spring Quarters.* Laboratory fee, $7.00 a quarter. Professor DAGGETT and Mr. SMITH.

74a. Electric Circuits. A mathematical study of the fundamental phenomena in the electric, magnetic, dielectric, and thermial circuits, emphasizing the circuital relations common to all. Considerable attention will be devoted to the application of complex quantities to alternating current circuits. Prerequisites, Engineering 63a-b-c and Mathematics 4-5-6E, or equivalent. *Three Hours a Week. Fall Quarter.* Professor DAGGETT.

74b. Hydro-Electric Power and Transmission. A survey of the problems involved in hydro-electric power developments and the transmission of electric power over long distances. Application of hyperbolic functions to the calculation of long lines. Study of super-power systems. Prerequisites, Engineering 33a-b and 74a. *Three Hours a Week. Winter Quarter.* Professor DAGGETT.

74c. Electrical Equipment Projects. Solution of problems involving the application of electrical energy to various industries. The problem will be varied to suit the individual needs of the members of the class. Especial attention will be given to problems of importance to North Carolina industries. Prerequisites, Engineering 63a-b-c or equivalent. *Three Hours a Week. Spring Quarter.* Professor DAGGETT.

84a-b-c. Dynamo Design. Electrical, mechanical and economic questions involved in the design of electrical machinery; the effect of the design constants on the proportions and operation of machines. Each student will be required to make complete calculations for a d. c. generator or motor, a transformer and an alternator. Co-requisite, Engineering 64a-b-c. *Three Hours a Week. Fall, Winter and Spring Quarters.* Professor LEAR.

94a. Engineering Thermodynamics. A study of the laws governing the transformation of heat into mechanical energy; properties of gases and vapors; thermodynamic potentials; steam-engine cycles and efficiency standards; pressure and velocity compounding in steam-turbines; theory of heat transfer in steam-boilers and condensers. Prerequisites, Engineering 93c or 90a-b-c and Mathematics 4-5-6E. *Three Hours a Week. Fall Quarter.* Professor DAGGETT.

Courses Primarily for Graduates

110a-b-c. Electrical Engineering Seminar. An advanced course in electrical theory, including the study of distributed inductance and capacity,

transient phenomena, e.m.f. wave-shapes in alternators and shychronous-converters and the application of hyperbolic functions to the solution of problems in power transmission and telephone circuits. Credit, 3 courses. *Fall, Winter and Spring Quarters.* Professor DAGGETT.

111a-b-c. Electrical Engineering Research and Design. The solution of one or more definite problems in some particular field of electrical Engineering. The work of this course will be outlined, as far as possible, to suit the needs of the individual student, and will consist of original investigations, designs, or the economic study of some existing electric power plant. Credit, 3 courses. *Fall, Winter and Spring Quarters.* Professor DAGGETT.

DEPARTMENT OF ENGLISH

EDWIN GREENLAW, FREDERICK HENRY KOCH, NORMAN FORESTER, JOHN MANNING BOOKER, JAMES FINCH ROYSTER, LOUIS GRAVES, THORNTON SHIRLEY GRAVES, Professors.

GEORGE MCFARLAND MCKIE, HENRY MCCUNE DARGAN, CLARENCE ADDISON HIBBARD, Associate Professors.

WILLIAM FLINT THRALL, Assistant Professor.

The Department of English offers to graduate students work in the following fields: (1) research leading to advanced degrees, with the training afforded by specialized courses in literature; (2) preparation for teaching English; (3) special study of the drama, including dramatic composition and training for work in community drama.

1. Intensive study and research are made effective through advanced lecture courses and the seminars, through the resources of a well-equipped library which is developing rapidly, and through the stimulus of association with men who are actively interested in research. There is an excellent seminar room, equipped with reference books and space for individual use of advanced students, which gives convenient access to the book stacks of the general library. The library is especially strong in the field of old and middle English and in the literature of the sixteenth and seventeenth centuries. Besides its share of the annual library appropriation, the department has the income from the Armfield Fund, which is applied exclusively to the purchase of books for advanced study. Students have also the privilege of membership in a club devoted to research. Besides the large number of special lectures given each year at the University, many of which relate directly to the advanced study of literature, graduate students have the privilege of membership in the special seminars, or short intensive courses in a limited field, which are conducted each year by distinguished scholars from other universities.

2. Besides the advanced courses, which afford opportunity for gaining that sound and accurate knowledge that is the first essential of good teaching, the attention of teachers of English and of those who are preparing for such work is directed toward the development of an effective method. Such students have an opportunity to observe the methods of

teaching and administration employed in the large undergraduate courses in English. Certain experiments in teaching these courses are now being tested; graduate students observe these experiments and discuss them with the instructors. The seminars include the study of method and there is also specific study of the high school and elementary college courses. The new and larger opportunities brought to teachers of English at the present time render this side of graduate study attractive and important.

3. In addition to the intensive study leading to the doctor's degree and the special preparation for teaching English, there are opportunities for work in specific fields, such as the drama, with a somewhat different point of approach. North Carolina is rich in dramatic materials, and the department is interested in the possibilities for treatment that these materials present, not only in the development of a native drama but also as a means for contributing to community welfare. In the course in dramatic composition, in the work of the Carolina Playmakers, and in extension work in community drama, advanced students find a field of constantly increasing interest.

Requirements for Advanced Degrees

Candidates for advanced degrees in the Department of English must have completed, before admission to candidacy, a sufficient number of undergraduate courses in English to constitute a major. The courses elected by a candidate for the master's degree must include either English 141, or two courses from the seminars 131, 132, 133. The other courses may be chosen from the group designated as courses for graduates or from those designated for graduates and advanced undergraduates. The minor may be chosen from some other department in the Division of Language and Literature, or, in special cases, from a department in some other division; but the plan of work as a whole must be closely unified, and no department may be chosen as a minor unless the candidate has previously completed, as an undergraduate, an amount of work in that department sufficient to constitute an undergraduate minor.

An oral examination on all the work, both undergraduate and graduate, done in the major and minor departments is required for the master's degree. A thesis which shows knowledge of the method of investigation and ability to make use of the results of such investigation, is required for the masters's degree. A reading knowledge of at least one foreign language is required for the degree. Candidates whose oral examination and thesis show unusual power may be awarded the degree with distinction, honors of two grades, "Honors" and "Highest Honors," being recognized. Students who desire the special recommendation of the department for teaching positions of the better grade are expected to acquaint themselves with the work done in the required undergraduate courses for Freshmen and Sophomores and to gain a first hand knowledge, in courses or through private reading, of the major works of English literature. Such students will usually find it advisable to spend two years in prepara-

tion for the master's degree, unless their undergraduate work in English has been very extensive and thorough.

For the degree of doctor of philosophy the same general procedure is followed, except that after the first year of study less attention is paid to credit gained for courses and more stress is put upon independent work. But for either degree the greatest amount of latitude is permitted and a variety of possible programs is offered. The test, in both cases, is of mastery of the field as a whole, rather than the securing of a certain number of credit hours.

Courses for Graduates and Advanced Undergraduates

41. The English Renaissance. The political and literary backgrounds of the English Renaissance, including the study of classical learning and medieval literature and thought influential during the period, with some consideration of the Italian Renaissance. The chief readings are in Spenser and his contemporaries. *Fall Quarter.* Professor GREENLAW.

42. The English Renaissance. A study of the works of Bacon, with emphasis on his relation to educational and political theory and his contribution to scientific method. *Winter Quarter.* Professor GREENLAW.

43-44. The Elizabethan Drama. A brief study of the beginnings of the English drama, followed by an intensive study of the period from Lyly to the closing of the theaters. While the method of the course is historical, stress is laid upon ideas rather than technique. The works of Shakespeare and his contemporaries form the basis for the study of certain aspects of Renaissance thought and for constant application of these ideas to life. *Double Course. Winter and Spring Quarters.* Professor T. S. GRAVES.

45. Milton. The works of Milton are studied in the light of the life, times, and culture of the poet, with some consideration of the literary problems which are involved in such a study. Class reports and a thesis or essay are required. *Spring Quarter.* Professor GREENLAW.

47-48. English Life and Thought in Eighteenth Century Literature. A survey of English literature from 1660 to 1789, emphasizing (1) changes in national life and manners; (2) the growth of philosophic and political systems; (3) certain characteristic literary forms, such as comedy, the essay, and the novel. *Double Course. Fall and Winter Quarters.* (English 48 will not be given in 1922-23.) Professor DARGAN.

56. Victorian Literature. Advanced Course. Practice in using the library through the preparation of papers in a limited field, that of the literature reflecting the political, economic, social, and religious thought of the Victorian era. Prerequisite, English 55 or its equivalent. *Fall Quarter.* (Given in 1923-1924 and in alternate years.) Professor BOOKER.

60. American Literature. Advanced course, a study of a limited subject, varied from year to year. Prerequisite, English 59. *Spring Quarter.* Professor FOERSTER.

68. Comparative Drama. A general survey of the drama and the theater from Aeschylus to Ibsen. The development of dramatic literature

is studied through representative plays (in translation) of the leading European dramatists. *Winter Quarter.* Professor KOCH.

69. Comparative Drama. A brief consideration of the early English drama and a study of the folk tradition in more recent times—especially in Ireland. Particular attention is paid to the Celtic renaissance—to the rediscovery of the Irish legends, and the work of Yeats, Synge, Lady Gregory, St. John Ervine, and others. Consideration is given to the beginnings of a new folk drama in America. *Spring Quarter.* (Offered in 1922-1923 and in alternate years.) Professor KOCH.

71. The Modern Drama. A study of representative plays of recent times, beginning with Ibsen. Special attenton is given to the function of the drama in interpreting modern thought and changing social conditions. *Spring Quarter.* (Offered in 1921-1922 and in alternate years.) Professor KOCH.

75. Restoration and Eighteenth Century Drama. A rapid survey of the progress of English drama from the Restoration to Sheridan. Special emphasis will be placed upon the types of drama that flourished during the years 1660-1790 and the influences that determined the theatrical conditions of the period. *Fall Quarter.* (Given in 1921-22 and in alternate years.) Professor T. S. GRAVES.

78. Literary Criticism. Through a study of such literary critics as Plato, Aristotle, Horace, Coleridge, Wordsworth, Henry James, and Croce, this course aims to render clear the principles of classical, pseudo-classical, romantic, and realistic art, and to consider the possibility of an absolute criterion for the evaluation of literature. *Fall Quarter.* Professor FOERSTER.

81. Old English. Introductory Course. A study of Old English grammar and syntax. A considerable amount of Old English prose is read. *Winter Quarter.* Professor ROYSTER.

82. Present-day English. A consideration of the habits of current English: recent spread of English; American English;class and geographical dialects; written and spoken language; word growth and decay; other tendencies observable in the living language. *Fall Quarter.* Professor ROYSTER.

83. Middle English. Chaucer. Previous training in Old or Middle English, not a fixed prerequisite. The work of the course will consist chiefly of a reading and discussion of Chaucer's works, with some consideratioin of Chaucer's language. *Spring Quarter.* (Given in 1922-23 and alternate years.) Professor ROYSTER.

84. Middle English Literature: Exclusive of Chaucer. The main purpose of the course is to acquaint the student with the social, political and religious background of medieval England. A fuller study will be made of the historical and philological relations of Middle English than in English 83. *Spring Quarter.* (Given in 1923-24 and in alternate years.) Professor ROYSTER.

Courses Primarily for Graduates

101. Beowulf. Prerequisite, English 81. *Spring Quarter.* Professor ROYSTER.

110. Spenser and His Age. Special topics. Prerequisite, Course 41. *Winter Quarter.* Professor GREENLAW.

112. Studies in Seventeenth Century Literature. Special problems in relation to Milton and his contemporaries. Prerequisite, English 45 or equivalent. *Fall Quarter.* Professor GREENLAW.

114. Studies in Eighteenth Century Literature. Special problems relating to the history of certain philosophic and political ideas in the literature of the "Enlightenment." Prerequisite, English 47 or 48. *Half Course. Spring Quarter.* Professor DARGAN.

117. The Romantic Movement. A systematic study of the origins and development of the Romantic Movement in England from the middle of the Eighteenth Century to the death of Scott. It includes consideration of the continental relations of English Romanticism, an analysis of its various elements, and a discussion of the classical and romantic ideals of art. Prerequisite, English 51 or its equivalent. *Winter Quarter.* (Given in 1922-1923 and in alternate years.) Professor FOERSTER.

125-126-127. Dramatic Theory and Practice. The purpose of this course is two-fold: to study the development of dramatic technique; and to give to graduate students an opportunity for advanced work in dramatic composition. The growth of dramatic theory and practice is treated in a comparative study of the classical, medieval, Italian renaissance, Spanish, Elizabethan, French, and modern dramatic criticism. Attention will be given to the relation of the dramatic practice to social conditions and to the theatre. The Carolina Playmakers furnish a working laboratory in production for plays written in this course. *Fall, Winter and Spring Quarters.* Professor KOCH.

131. Seminar. Methods. The principles and methods of the higher study of English. A general introduction to graduate work with a series of simple problems in bibliography and literary history. *Fall Quarter.* Professor T. S. GRAVES, chairman.

132. Seminar. Literary Criticism. A critical study of a single writer in the light of the results attained in English 78. Prerequisite, English 78; ordinarily also 131. *Winter Quarter.* Alternate years (to be given in 1923-24). Professor FOERSTER.

133. Seminar. The Teaching of English. The method and content of the English course in high schools and in elementary college courses. *Half Course. Spring Quarter.* Professor ROYSTER, chairman.

141. Research in a special field under the direction of a member of the department.

DEPARTMENT OF GEOLOGY

COLLIER COBB, JOSEPH HYDE PRATT, WILLIAM FREDRICK PROUTY, Professors.

To men entering the profession of geology opportunities for useful employment are open in teaching, in state and national bureaus and surveys, in mining, in investigating oil fields, in working various economic geologic deposits, and in soil investigation. Preparation for this work may be had through the regular college course, with geology as the major study throughout the course, and the addition of field-work in vacation and work in the Graduate School for one or more years. It may also be obtained through a course in the School of Applied Science leading to the degree of bachelor of science in geology; and this should in every case be followed by work leading to the degree of master of science as outlined below.

The work of the graduate student specializing in geology should be, in large measure, the investigation of problems in field, and the working out of many of the details in the laboratory. At the present time the following lines of investigation are being pursued by members of the Department of Geology: mineral analysis of seashore sands and their value as a source of economic minerals, shore-line processes in relation to harbor development, the pegmatite deposits of North Carolina, the character and location of road materials in relation to highway construction in North Carolina, geological map of the Chapel Hill area, stratigraphic sequence in Catawba Valley, Va., geology of Bethel fault area, Ala.

Graduate Degree in Geology

The course leading to the degree of *master of science* in geology is open to students who have graduated with the degree of bachelor of science in geology in this University, and to students who have completed the equivalent of the course as prescribed by the University. The course consists of a special research in some one branch of geology, pursued throughout the year, and six weeks of field-work in the summer under the direction of a member of the graduate faculty, followed by the completion of the investigation during the fall term. These researches constitute six full courses for the master's degree. In addition to this major, the candidate must complete three approved courses in one or more of the following departments; chemistry, civil engineering, zoology or botany.

Geological Laboratories and Museum

The geological laboratories occupy the first floor and three rooms on second floor of New East building and basement room in Alumni. In addition to a lecture room with a seating capacity of about fifty, there are laboratories for mineralogy and economic geology, dynamics and structural geology, petrology, soil investigation and photographic work. The labora-

tories are well supplied with minerals, rocks, thin rock sections, materials for study of economic geology, lantern slides, maps, charts, microscopes and instruments for advanced work.

The department library is open to all students specializing in geology. The larger library of the North Carolina Geological and Economic Survey, situated on the second floor of New East is accessible to graduate students.

The geological museum on the first floor of New East contains large collections of minerals, rocks and fossils. It is open daily to the student body and the public.

Courses for Graduates and Advanced Undergraduates

8. Structural and Field Geology. Lectures with laboratory work and field work. Prerequisite, Geology 1-4. *Fall Quarter.*. Professor PROUTY.

9. Stratigraphical Geology. Lectures and laboratory work. Prerequisite, Geology 1-2. *Winter Quarter.* Professor PROUTY and Assistant.

10. Oil and Gas Geology. Lectures, collateral reading and reports. Prerequisite, Geology 1-2, Chemistry 1-2. *Spring Quarter.* Professor PROUTY.

11. Non-metallic Mineral Deposits. Lectures, laboratory work and special reports. Prerequisite, Geology 1-4. *Fall Quarter.* Professor PROUTY and Assistant.

12. Metallic Mineral Deposits. Lectures, laboratory work and special reports. Prerequisite, Geology 1-4. *Winter Quarter.* Professor PROUTY.

13. Petrology. Study of the common rocks without the aid of the microscopes. lectures, laboratory work and field work. Prerequisite, Geology 1-4. *Winter Quarter. Half Course.* Professor COBB.

14. Petography. Identification of rocks and minerals, in fragments and thin sections, by use of the polarizing microscope; lectures and laboratory work. Prerequisite, Geology 3-4 and 13. *Spring Quarter.* Professor PROUTY.

15. Paleontology. Lectures and laboratory work. Prerequisite, Geology 1-2. *Winter Quarter.* Professor PROUTY and Assistant.

23-24. Origin and Nature of Soils. Lectures, laboratory work and field investigation. Students in this course are expected to keep Saturdays open for field work. Prerequisite, Geology 1-4, Chemistry 1-2 and 31-32, Botany 1-2. *Winter and Spring Quarters.* Professor COBB and Assistant.

28. Plain-table Mapping of Special Area. Mostly field work. Students in this course are expected to keep Saturdays open for field work. *Fall Quarter.* Professors COBB and PROUTY.

42. Mineral and Ore Deposits. Lectures supplemented by laboratory and field work. *Spring Quarter. Half Course.* Professor PRATT.

43. Advanced work in Mineralogy. *Winter Quarter Half Course.* Professor PRATT.

51-52-53. Advanced Field Work and Special Research in Geology and Geography. Problems assigned individually and work adapted to the professional needs of the student. Students in this course are expected to keep Saturdays open for field work. *Three full Courses.* Professors COBB and PROUTY.

Courses Primarily for Graduates

104-105-106. Special Research in Geology and Geography. The student is expected to devote six weeks to work in the field, accompanied by the instructor, and to work up his results during the first term of the college year. The entire research constitutes three courses. Professors COBB and PROUTY.

107-108-109. Special Research in economic geology, in historical geology, or in petrology and petrography, two quarters of which must be taken as a seminar course.

DEPARTMENT OF GERMANIC LANGUAGES

WALTER DALLAM TOY, Professor.
KENT JAMES BROWN, Associate Professor.

The courses for advanced undergraduates and graduates offered by the German Department are designed to meet the needs of three classes of students: those whose interest in language and literature prompts them to pursue their German studies beyond the undergraduate stage; those who are preparing to teach in schools and private academies; and those who purpose to adopt the study of Germanic languages as a profession.

For all of these classes the department offers courses covering different periods of the language and literature. The dialect courses are intended primarily for those who will specialize in Germanic languages.

In view of the great advance made in recent years in our secondary schools, there is an increasing demand for trained teachers. German, it is confidently believed, will soon be established as one of the regular high school studies. It is therefore wise for intending high school teachers interested in German to prepare to teach this language. They should take the master's degree with German as their major subject.

Such students will first lay a good foundation in their acquaintance with the language, including the power to carry on simple conversation in German, and then extend their acquaintance in the direction both of language and literature as far as time permits.

In the advanced courses which permit of seminary methods, it is possible to discuss the relative merits of different methods of teaching. The members of the teaching staff of the department are ready to direct the private studies of those who are beginning in advance to study the practical problems of the teacher.

For those who will devote themselves to the Germanic languages as a profession the courses offered will serve as a guide in their private work. The Library contains a considerable number of valuable books bearing on Germanic literature and philology. It is hoped that this departmental library will be greatly increased not only by the general appropriations but also by special gifts or bequests such as the May Fund.

Students intending to specialize in the Germanic languages should take the degree of Ph.D.

Courses for Graduates and Advanced Undergraduates

41-42. Goethe's Life and Works. Lectures, reading, reports. Götz von Berlichingen, Werthers Leiden, Tasso, Gedichte, Hermann und Dorothea, Dichtung und Wahrheit. References: Scherer's and Francke's histories of German literature. English and German works on Goethe's life. Prerequisite, German 21-22, or 23, or 25-26. *Double Course. Two Quarters* Professor BROWN.

This course may be elected only after consultation with the instructor.

43-44. Goethe. Faust, Parts I and II. Prerequisite, German 21-22. or 23, or 25-26. *Double Course. Two Quarters.* Professor TOY.

This course may be elected only after consultation with the instructor.

45-46. Kleist and Hebbel. Translation and interpretation of selected dramas; lectures and collateral reading. Prerequiste, German 21-22, or 23, or 25-26. *One Quarter.* Professor BROWN.

Courses Primarily for Graduates

101. Gothic. Braune's *Gotische Grammatik;* selected parts of Paul's *Grundriss der Germanischen Philologie.* Introduction to Germanic philology. Prerequisite, German 21-22, or 23, or 25-26. Professor TOY.

103. Old High German: Braune's *Althochdeutsche Grammatik;* Braune's *Althochdeutsches Lesebuch.* Prerequisite, German 21-22, or 23, or 25-26. Professor TOY.

107. Middle High German. Paul's *Mittelhochdeutsche Grammatik;* Bachmann's *Mittelhochdeutches Lesebuch*; translation into New High German. Prerequisite German 21-22, or 23, or 25-26. Professor BROWN.

DEPARTMENT OF GREEK

WILLIAM STANLY BERNARD, A.M., Professor.

At present the Department of Greek is prepared to offer advanced courses leading only to the degree of master of arts. This degree may be achieved in one year of graduate study, preferably two. The department is especially well equipped to offer this degree for work done in New Testament language and literature. It is very desirable that the candidate for this degree should be prepared to pursue courses offered in advanced work by the Department of Latin.

The Department of Greek aims to coöperate with the other departments of language and literature in the University in enabing the advanced student to pursue the broader culture set forth as a function of the Graduate School in paragraph 3, under *General Purpose of the Graduate School* in this catalogue, page 21. To this end courses in English translations of Greek literature are offered, which do not require the ability to read the Greek language. Special emphasis is given to such courses as embrace aspects of the Greek genius: Greek epic, drama, philosophy, art. Such courses may be elected with the approval of the special advisory committee for the applicant.

Library facilities for pursuing these aims are quite adequate. The classical departments have a joint seminar room in which are kept in easy access the libraries of both departments. These libraries contain the standard works of reference, complete sets of the leading philological journals, sets of lantern slides and prints illustrating archaeology, art, drama, etc. The Department of Greek is endowed with a special fund, the Alexander Memorial Fund, for the purchase of books.

Courses for Graduates and Advanced Undergraduates

21-22. Greek Drama. An extended reading and study of the Greek drama with lectures on the origin, history and structure of the drama. Prerequisite, Greek 6. *Double Course.* Professor BERNARD.

23-24-25. Greek Drama in English Translations. A course designed to embrace the origin, development, technique and content of the entire Greek Drama, with emphasis on the tragedy as one interpretation of Greek life and thought as a contribution to world progress. Open to graduates and such seniors and juniors as may be admitted by the instructor. *One and a Half Courses. Three Quarters.* Professor BERNARD.

43-44. The Greek New Testament. The Acts of the Apostles, study of grammar and diction, comparison with English version; the Gospels, with selections from the Epistles; the principles of textual criticism; sources and history of the Greek text and the versions. Professor BERNARD.

61-62. Classical Archaeology. History and principles of Greek and Roman architecture, sculpture, painting, with some account of the minor arts. Lectures with prescribed reading. Professor BERNARD.

This course is the same as Latin 61-62.

Courses Primarily for Graduates

101. Seminar. The critical study of an author or period. During 1922-1923 this study will be directed to the solution of one of the numerous syntactical problems of the language of the New Testament.

THE DEPARTMENT OF HISTORY AND GOVERNMENT

JOSEPH GREGOIRE DE ROULHAC HAMILTON, HENRY MCGILBERT WAGSTAFF, WILLIAM WHATLEY PIERSON, JR., ROBERT DIGGS WIMBERLY CONNOR, Professors.

FRANK PORTER GRAHAM, WALLACE E. CALDWELL, Associate Professors.
FRANCIS R. FLOURNOY, Assistant Professor.

The resources of the University for graduate instruction by the department make possible the offering of courses under the following heads: History of the Civil War and Reconstruction, constitutional history of the United States, American political theories, Hispanic-American history, international relations, and North Carolina and Southern history.

The Library

The library resources for graduate study in history at the University of North Carolina offer exceptionally rich materials in two fields—those of North Carolina history and the Civil War period. The University has had the good fortune to acquire the collection of Dr. Stephen B. Weeks, which contains more than 10,000 titles of books, pamphlets, newspapers, and manuscripts relative to the history of North Carolina. This collection—together with other works possessed by the library, particularly those placed there by the North Carolina Historical Society, and with the manuscripts of the North Carolina Historical Commission, to which the students may have access—must be regarded by historians as one of the important collections in the United States. The Kenan fund for materials on the Civil War period has enabled the library to secure a constantly increasing collection, which is especially complete in materials on military history. Recent additions, including a partially complete set of Hansard reports and an important group of books, documents and pamphlets have been made respectively in English and in Hispanic-American history. The Peabody Collection provides a basis for the study of international law and diplomacy. In the Kidder, Clark Bridgers, and Howard collections the University library has a noteworthy group of newspaper materials.

History Seminar Room

The history seminar room, equipped with tables and filing cases, is a repository of important newspaper collections. It is the headquarters for graduate students in history and is situated within easy access to the stacks.

Publications

Under the direction of the North Carolina History Society and under the editorship of certain members of the department, there are published the James Sprunt Historical Publications. Aided by the benefactions of Dr. James Sprunt, of Wilmington, N. C., these publications have reached sixteen volumes. The contents, it may be noted, have in the main been relative to the North Carolina State and colonial history and government, and its pages have been open to students as well as to specialists.

HISTORY

Courses for Graduates and Advanced Undergraduates

12. Medieval Europe. A brief general course dealing with the thought and institutions of Europe from the decline of the Roman Empire to the rise of national states. Text-books, readings, and lectures. *Fall Quarter.* Professor WAGSTAFF.

14. Modern Europe. A study of modern and contemporary Europe from the angle of the primary forces that shaped the life of European nations during the past hundred and fifty years. Text-books, readings and lectures. *Spring Quarter.* Professor FLOURNOY.

17-18. History of North Carolina. General survey of colonization and territorial growth; colonial institutions; intercolonial and imperial rela-

tions; revolution and independence; constitutional and institutional development; Federal relations; Civil War and reconstruction; recent political, economic, and educational developments. Lectures and readings. *Fall and Winter Quarter.* Professor CONNOR.

22. The Protestant Revolt. A study of the religious, intellectual, political, and economic aspects of the Protestant Revolt, with detailed consideration of the sixteenth century organization and criticism of the Catholic Church; the religion and dogmas of Luther, Zwingli, Calvin, Knox, and Cranmer; the influence of nationalism and absolutism on the revolution; the Catholic counter-reformation; and the establishment of state churches. (To be omitted in 1922-1923.) Professor PIERSON.

23. The French Revolution and the Napoleonic Period. A course which deals with the causes—political, intellectual, social and economic—events and results of the French Revolution. Lectures, text-books and readings. *Spring Quarter.* Professor PIERSON. (To be omitted in 1921-1922.)

27. Colonial American History. A general survey of the history of Colonial America: European expansion; discoveries, explorations and colonization; race elements; institutions; social, economic and political development; imperial relations; revolution and independence. Text-book, lectures and readings. *Winter Quarter.* Professor CONNOR.

28. The Federal Period. American history through the period 1789-1860. A general survey of the period from the formation of the Constitution to the Civil War in which an intensive study is made of the conflict in opinion respecting the nature of the Union, Jacksonian democracy, the Westward Movement, and the controversy over slavery. Text-books, readings and lectures. *Winter Quarter.* Professor GRAHAM.

29. Civil War and Reconstruction. A course dealing with the more important constitutional, political and economic phases of the period from 1861 to 1876. Lectures, readings and reports. *Spring Quarter.* Professor HAMILTON.

30. Contemporary American History. A general course dealing with the political, economic, and social history of the United States from 1876 to the beginning of the World War, with detailed consideration of the influences of the Civil War and Reconstruction upon subsequent American history; the war amendments in theory and practice; business and politics; the Granger movement, the currency question, the tariff, the trusts, relations of capital and labor, the foreign relations of the United States, the Spanish-American War and its results, the progressive movement in American politics. Lectures, text-books and readings. *Spring Quarter.* Professor PIERSON.

33. Roman History. An advanced course in the history of Rome with attention chiefly directed to institutional growth, historical problems, and source study. Lectures and readings. *Fall Quarter.* Professor CALDWELL.

Courses Primarily for Graduates

100-101-102. North Carolina History. A seminar course on the social, political and economic development of North Carolina. The course runs

through the year and a weekly conference will be held for the presentation of reports and discussions. *Fall, Winter and Spring Quarters.* Professor CONNOR.

106-107-108. The Jacksonian Period. A seminar course in the political history of the period from the era of good feeling to the Mexican War. *Fall, Winter and Spring Quarters.* Professor HAMILTON.

109. Seminar. Research in a special field under the direction of a member of the department.

110-111-112. Ancient History. A seminar in some phase of ancient history. Professor CALDWELL.

GOVERNMENT

Courses for Graduates and Advanced Undergraduates

5. The Elements of Political Science. A general course in which a study is made of the principles of political science and of the important theories respecting the nature, origin, forms and ends of the state and of government. An examination of the literature of the subject will be made, supplemented by students' reports on selected political theorists. Lectures, text-books and readings. *Winter Quarter. One Course.* Professor PIERSON.

8. The Constitution of the United States. In this course an intensive study will be made of the workings of the American Constitution. The subject will be approached from the legal and constitutional rather than from a political angle. The main body of the work consists in the study and analysis of cases, supplemented by lectures and discussions. *Fall Quarter.* (To be omitted in 1922-1923.)

11. American State Government. A course dealing with the origins, development, and methods of the state governments. In connection with the course will be a special study of the government of North Carolina. *Fall Quarter.* Professor CONNOR.

Courses Primarily for Graduates

100-101-102. American Political Theory. A seminar course respecting the political philosophy that has been developed in the United States. In the fall quarter, the political theory of the colonial period and the American Revolution will be studied; in the winter quarter attention will be given to the theories associated with the formation of the Constitution and its early interpretations, the nature of the Union, and the slavery dispute; in the spring quarter, the political theory of the Civil War and the contemporary United States will be considered. Lectures, readings and reports. *Fall, Winter and Spring Quarters.* Professor PIERSON.

103-104-105. Development of the American Constitution. An inquiry into the sources of the American Constitution and a study of its application and development under changing conditions of the American people. Research in special topics. Lectures, reading and reports. *One and a Half Courses.* Professor WAGSTAFF.

106-107-108. Modern International Relations. A conference course dealing with the history and methods of modern international relations. Special emphasis will be laid upon specified topics, such as modern imperialism, the influence of nationalism, and the movement for international organization. The course is open in the Fall Quarter to Seniors with a credit of one course. *Five hours a week in Fall, and one hour a week in Winter and Spring Quarters.* Professor FLOURNOY.

109. Seminar Course. A research course in a special field under the direction of a member of the department.

DEPARTMENT OF LATIN

GEORGE HOWE, Professor.
GUSTAVE ADOLPHUS HARRER, Associate Professor.
GEORGE KENNETH GRANT HENRY, Assistant Professor.

The graduate work of the Department of Latin is planned primarily for the training of teachers, but its course and method are made flexible enough to render it a profitable field of study for purely cultural purposes. In every case it presupposes study of the subject during at least three years of the undergraduate period embracing work in the language and in the literature. Instruction is given through the medium of regular courses of lectures and reading, and of a weekly seminar in which the student is required to do a piece of original investigation. Each student works under the direct supervision of a single instructor, who plans the whole of the major work, gives individual advice in and out of class meetings, and guides and passes upon the thesis submitted for the degree.

A special room in the University Library is set apart for students of the classics. It is supplied with all the more important editions of the authors, with the standard books of reference in the various branches of the subject, and with sets and current issues of journals in language, literature, archaeology, etc. The department subscribes for the following periodicals: *The Classical Journal, The Classical Weekly, Classical Philology, American Journal of Philosophy, American Journal of Archaeology, The Journal of Roman Studies, Journal of Hellenic Studies, Journal of Roman Studies, The Classic Review, The Year's Work in Classical Studies, Hermes, Glotta, Philologische Wochenschrift, Jahresbericht der klassischen Altertumswissenshaft, Philologus, Rheinisches Museum,* and others. Working tables and cabinets for papers are provided for the convenience of the students.

The degree of master of arts is awarded upon the satisfactory completion of a year's work. A student majoring in the subject is expected to devote from one-half to two-thirds of the time to courses in the department and the remainder of courses in closely allied branches of study. There is no exact prescription of courses except that the seminar is required for all students majoring in Latin; the other courses are determined upon only after the needs of the individual applicant have been discovered.

While knowledge of other foreign languages is not a prerequisite for candidates for the degree, a reading knowledge of French and German will

broaden the scope of the work and render it very much more profitable. If preliminary work in Greek has been done, a limited number of courses in that department may be accepted in lieu of courses in Latin, or Greek may be made the minor subject of study. Courses in Greek literature taught through the medium of English may be prescribed for students who have not had opportunity to study the language.

Courses for Graduates and Advanced Undergraduates

12. Roman Historical Literature. A study of the structure, purposes, and methods of the most significant works. Translation and readings in English from the literature; reports; lectures. *Fall Quarter.* Professor HARRER.

13. Roman Dramatic Literature. A study of the historical development of Latin comedy and tragedy; reading of selected plays. *Winter Quarter.* Professor HENRY.

14. The Latin Epic. Vergil will be the central theme of this course, but the development of the Latin epic will be treated historically, and illustrative readings in other poets will be assigned. *Spring Quarter.* Professor HOWE.

19. Cæsar. The political career and literary works of Cæsar will be studied, and selections from the Gallic and Civil wars will be translated. *Fall Quarter.* Professor HARRER.

30. Cicero. A study of Cicero as statesman and advocate. Selected letters, as well as a number of the orations, will be read. *Winter Quarter.*

(In courses 14, 19, and 30 the needs of high school teachers of these authors are considered.)

31. Latin Prose Literature. The course is concerned mainly with the study of the epistolary and historical literature: readings of selected lettters from Cicero and Pliny and of passages from Livy, Tacitus and other historians. *Spring Quarter.* Professor HENRY.

Courses Primarily for Graduates

101-102-103. Latin Seminar. This course is devoted to the study in detail of particular authors of periods in Roman literature, the subject matter varying from year to year. It involves wide reading in the Latin authors and in the critical literature concerning them, with oral and written reports by the student. Lectures and conferences. *Three quarters, five hours.* For the year 1922-1923: *Fall Quarter,* Cicero (Professor HOWE); *Winter Quarter,* Roman Elegiac Poets (Professor HOWE); *Spring Quarter,* Tacitus (Professor HARRER).

104. Latin Epigraphy. The aim of the course is to acquire facility in the deciphering and translating of inscriptions, to study in detail a selection of signficant inscriptions and their value in the field of Roman studies. *Fall Quarter, five hours.* Professor HARRER.

105. Latin Paleography. The course will include a study of the more important scripts, practice in decipherment, and the methods of textual criticism. *Winter Quarter, five hours.* Professor HARRER.

DEPARTMENT OF MATHEMATICS

ARCHIBALD HENDERSON, Professor.
JOHN WAYNE LASLEY, ALLEN WILSON HOBBS, Associate Professors.
ARTHUR SIMEON WINSOR, ERNEST LLOYD MACKIE, Assistant Professors.

Opportunities Offered by the Department and by the Field Which It Covers

The subject of mathematics constitutes the foundation upon which the general subject of engineering, in its broader aspects, solidly rests. This is true of such subjects as electrical, chemical, and mining engineering; but more especially, all work in scientific design of structures and in civil engineering depends upon minute and detailed knowledge of mathematical laws and principles.

The material welfare and continuing progress of any state is dependent upon the development of science, and in particular upon the substantial advance of the engineering profession. Since the theory of structures and the science of engineering, in general, have their bases in mathematics, the courses in mathematics for the advanced student are designed, in great measure, to meet such needs. Thus the courses in mathematics are coordinated with reference to their application in the practical sciences.

On the pedagogical side, many of the courses, in particular those in pure mathematics, are designed for the student purposing to become a teacher in the schools, or a professor in college or university. In the light of the advance of mathematical science, and the wide ramifications of the more modern branches, many courses are offered, to enable the student to specialize along a number of different lines. A group of courses permits specialization in the general subject of geometry; another group of courses deals with the broad division of analysis; a third grouping permits specialization in mechanics.

The Resources of the Department

In the recently completed Phillips Hall, thoroughly modern in construction and adequate in equipment, are located the departments of Mathematics, Physics, Civil and Electrical Engineering, and Mechanical Drawing. This concentration af allied departments in a single building affords the departments concerned, individually and collectively, striking and exceptional advantages. Capacious lecture halls and small seminar rooms, departmental offices convenient for consultation, well-equipped testing rooms and laboratories, and commodious, well-lighted quarters for students in drawing—all are found beneath a single roof. In this building will be a group departmental library, rich in works in mathematics, pure and applied, physics, and engineering civil and electrical. The mere existence

of such a body of collected scientific knowledge, in the atmosphere created by the scientific work in progress in the class rooms and laboratories, is a powerful stimulus to the developing and promotion of research.

The Requirements for Advanced Degrees

Candidates for the degree of master of arts or for the degree of doctor of philosophy must meet the requirements laid down in the Bulletin of the Graduate School.

The courses in the major subject are to be selected from the courses enumerated and described below, reference being had to the particular degree sought. The courses may be grouped under the three main divisions: analysis, geometry, and mechanics. The grouping and order of the courses will be arranged by conference between professor and student, the controlling factors being the previous preparation and training of the student and the particular degree sought.

The courses in the minor subjects, as a rule, will be chosen from the general fields of the allied and related sciences, such as physics, astronomy, and engineering—civil, electrical, and chemical.

For the candidate for an advanced degree, a working knowledge of French and German is desirable; indeed, in the case of the candidate for the degree of doctor of philosophy, such familiarity with French and German scientific terminology and facility in the reading of foreign journals, is virtually indispensable. Advanced work in the languages in special cases, may be done as part of the requirement for the minor subject.

Courses of Study

In the courses listed under "Courses for Graduates and Advanced Undergraduates" and described below, course 51 (Methods in the Teaching of Elementary Mathematics), does not make prerequisite a knowledge of the calculus. To the taking of all the other courses mentioned, a knowledge of the calculus is prerequisite. In view of these distinctions, complete and thorough courses (numbers 4 and 5) are given annually without exception. The advanced undergraduate specializing in mathematics, as well as the candidate for an advanced degree in mathematics, must elect Mathematics 5, in order to take up additional subjects, so large a proportion of which presupposes a working knowledge of the calculus.

Courses for Graduates and Advanced Undergraduates

50. The History of Mathematics. An account of some of the men and events in the history of mathematics. The content of this course is primarily mathematical, the topics being considered in the light of their historical setting. Prerequisite, Mathematics 5. *Winter Quarter. Three hours a week.* Professor LASLEY.

51. Methods in the Teaching of Elementary Mathematics. Throughout this course stress will be placed on method on the basis of given mathe-

matical content. The inherent connection and inter-relationship of arithmetic, algebra and geometry will be fully exhibited and illustrated. Prerequisite, Mathematics 5. *Fall Quarter. Five hour a week.* Professor Professor HENDERSON.

52. Elementary Projective Geometry. The fundamental notions of projective geometry, projection, section, perspectivity, etc. Both analytic and geometric methods are employed. Projective correspondence, involution and general projective relations between one-dimensional forms are studied. Prerequisite mathematics 5. *Fall Quarter. Five hours a week.* Professor LASLEY.

53. Advanced Projective Geometry. General homogeneous coördinates, collineation, correlation, homology, projective correspondence between two-dimensional forms are studied. A projective theory of conics is developed, also the notions of line geometry. Prerequisite, Mathematics 52. *Spring Quarter. Five hours a week.* Professor LASLEY.

54-55. Analytic Geometry of Space. Treats of the spatial relations from the analytic standpoint. Deals with quadric surfaces, envelopes, foci, quadri-planar and tetrahedral coördinates, developable surfaces, curves in space, curvature of surfaces, higher surfaces, etc. Prerequisite, Mathematics 5. *Fall and Winter Quarters. Five hours a week.* Professor HENDERSON.

56-57-58. Graphical Analysis. Alignment charts and empirical formulas. Prerequisite, Mathematics 5. *Fall, Spring and Winter Quarters. Three hours a week.* Professor HOBBS.

60. Dynamics. Differential equations of motion, equations of orbits, D'Alembert's principle, motion of a rigid body. Prerequisites, Mathematics 10 and 12. *Winter Quarter. Five hours a week.* Professor HOBBS.

61. Vector Analysis. A study of some of the general principles of mechanics in the language of vectors. Prerequisite, Mathematics 60. *Spring Quarter. Five hours a week.* Professor HOBBS.

62. Foundations of Geometry. A course designed to meet the needs of students experienced in mathematical thinking. A survey of the contributions of Pasch, Peano, Hilbert and their schools to our knowledge of the foundations of geometry. A study of the axioms, of systems of geometry, etc. Prerequisites, Mathematics 5 and 52. Not given in 1922-23. *Five hours a week.* Professor HENDERSON.

63. Advanced Calculus. This course completes and rounds out the subject as given in Mathematics 5. Rigor in demonstration is insisted upon. The course will be designed to meet the particular needs of the class, for example, largely a problem course, or a special study of functions of a complex variable, elliptic functions, etc. A thorough knowledge of the calculus is aimed at in this course. Prerequisite, Mathematics 5. Not given in 1922-23. *Five hours a week.* Professor HENDERSON.

Courses Primarily for Graduates

100. Theory of Functions of a Real Variable. The real number system, elementary properties of point sets, variables and functions, series of

functions, implicit functions, theory of definite integrals. Prerequisites, Mathematics 10 and 13. *Fall Quarter. Five hours a week.* Professor MACKIE.

101. Theory of Functions of a Complex Variable. Complex numbers, differentiation and intergration, conformal mapping, linear fractional transformations, single and multiple valued functions. Prerequisite, Mathematics 100. *Winter Quarter. Five hours a week.* Professor MACKIE.

102. Higher Plane Curves. A course dealing with plane curves, particularly conics, cubics, and quartics; polarity; Plucker formulae; curves of Hesse, Steiner and Cayley; classification of cubics, intersections of curves, singularities of curves, unicursal curves. Prerequisite, Mathematics 10. Not given in 1922-23. *Five hours a week.* Professor LASLEY.

103. Lie Theory of Differential Equations. A study of differential equations from the standpoint of continuous groups. Prerequisite, Mathematics 10. Not given in 1922-23. *Five hours a week.* Professor HOBBS.

104. Theory of Numbers. This course deals with the study of numbers in general. Modern developments of the study are closely followed. Concerns itself with the various types of numbers, quadratic forms, transformations, etc. Prerequisite, Mathematics 10. Not given in 1922-23. *Five hours a week.* Professor HENDERSON.

105. Differential Geometry. A study of the metric differential geometry of curves, surfaces and curves on surfaces, systems of curves defined by differential equations, surfaces given by two quadratic differential forms. Prerequisite, Mathematics 10 and 54. Not given in 1922-23. *Five hours a week.* Professor LASLEY.

106. Introduction to the Theory of Relativity. In this course the essential features of the special and the general relativity theories of Einstein are set forth from the mathematical point of view. Particular study is made of the Lorentz transformation, the theory of tensors and the absolute differential calculus. Prerequisite, Mathematics 5 and 12. *Spring Quarter. Five hours a week.* Professor HENDERSON.

107. Introduction to the Theory of Finite Groups. Deals with the theory of substitutions in general, and as applied to the algebraic equation. Simple and compound groups, transitivity and primitivity. Cyclic and linear groups, linear fractional substitutions, etc. Numerous applications in algebra and geometry. Prerequisite, Mathematics 13. Not given in 1922-23. Five hours a week. Professor HENDERSON.

108. Modern Higher Algebra. Polynomials and their fundamental properties, determinants, theory of linear dependence, linear equations, matrices, invariants, linear and quadratic forms. Prerequisite, Mathematics 7. *Spring Quarter. Five hours a week.* Professor WINSOR.

109. Elements of Non-Euclidean Geometry. The subject is treated chronologically. The contributions of Boylai, Lobatchewsky, Riemann, Cayley, Klein are studied, analyzed and compared. Prerequisite, Mathematics 52. Not given in 1922-23. *Five hours a week.* Professor HENDERSON.

DEPARTMENT OF PHILOSOPHY

HENRY HORACE WILLIAMS, Professor.

Courses for Graduates and Advanced Undergraduates

The attention of students interested in philosophy is called to the Graham Kenan Fellowship in Philosophy. This fund yields about $1,500 a year and may be given to one student, or two, as circumstances suggest.

10-11-12. This is a course of logic that runs through the year, meeting three times a week. The work may appeal to one who desires to know what the thinking process is. This course lays the basis for work in philosophy.

16-17-18. This course will appeal to one who desires to consider the fundamentals in our life. The problem of the "Sacred Book," the problem of the miracle, the problem of the State are questions studied. This course runs through the year, meeting three times a week.

19-20-21. This is a companion course to 16-18. It limits its work to the problems belonging to the Christian civilization. The course runs through the year, meeting three times a week. In each of these courses the student is expected to undertake to understand for himself some fundamental problem, and to incorporate his findings in a thesis.

DEPARTMENT OF PHYSICS

ANDREW HENRY PATTERSON, Professor.
OTTO STUHLMAN, JR., Associate Professor.

Physics in its broader aspects is one of the fundamental subjects upon whose knowledge the progress of most sciences and the development of industry depend. The past two decades have witnessed the tremendous advances made in the engineering sciences through the increase of knowledge relating to the fundamental principles of physics. This has led to the development of the wireless telegraph, the wireless telephone, the thermionic valves, the X-ray tubes, the incandescent lamp, etc. It has made the modern technique of Roentgenology, electro and radio-therapeutics possible and has advanced the understanding of atomic structure in the field of chemistry.

It offers an opportunity as a scientific career which for interest cannot be surpassed by any other profession. Able physicists with thorough training in the fundamental principles of physics and in research are in constant demand in the research and testing laboratories of our industries and in the government departments, such as the Bureau of Standards, the Meteorological Service, etc.

Its fundamental character is acknowledged by the various scientific professions because a good knowledge of the subject is required for admission to medical, dental and other technical courses.

The demand for the trained physicist in the teaching profession is at present greater than ever.

To meet the above demands, the department is offering a cycle of

courses which extends over a period of two years, the object of which is to provide a thorough knowledge of the underlying principles of the subject in its various ramifications. The aim is to present the subject in its modern aspect with sincerity and thoroughness, requiring at the same time sufficient work in the laboratory which will provide the necessary first hand contact with the material under consideration.

The student interested in allied fields will find here a group of subjects which will help him interpret his specialty and develop a broader point of view.

Courses for Graduates and Advanced Undergraduates

5. Heat and Thermodynamics. Lectures and laboratory work. Prerequisites, Physics 1-2, Mathematics 4. Alternate years only; offered in *Fall Quarter*, 1922. Professor PATTERSON.

6. Mechanics and Wave Motion. Lectures, problems and laboratory work. Prerequisite, Physics 1-2, Mathematics 4. Alternate years only; offered in *Fall Quarter*. Professor STUHLMAN.

7. Modern Electrical Theory. Lectures and laboratory work; the electron theory, atomic structure, radioactivity, etc. *Spring Quarter*. Prerequisites, Physics 1-2, Chemistry 1. Professor PATTERSON.

8. Advanced Electricity and Magnetism. An introduction to the mathematical treatment of these subjects. Alternate years only; offered in *Spring Quarter*, 1923. Prerequisites, Physics 1-2, Mathematics 4. Professor PATTERSON or Professor STUHLMAN.

9. Optics. A treatment of the fundamental principles of geometrical and physical optics. Lectures, problems and laboratory work. Alternate years only; offered in *Spring Quarter*, 1923. Prerequisites, Physics 1-2, mathematics 4. Professor STUHLMAN.

DEPARTMENT OF PSYCHOLOGY

JOHN FREDERICK DASHIELL, Professor.
HARRY WOLVEN CRANE, Associate Professor.

The emphasis of the work in the Department of Psychology is along the lines of interest in the science for its own sake; and students who are interested in the subject as an independent natural science are given opportunity and coöperation in research. In addition, the demand on the part of other fields for reliable knowledge of human nature, especially in the various professional schools, amounts to a call for coöperation from this department; and some of the instruction and research is shaped with a view to supplying such assistance to education, medicine, commerce, sociology, etc.

The department is actively coöperating with the State Board of Charities and Public Welfare in the mental examination of abnormal cases throughout the state; and the properly interested and qualified graduate student may be given certain opportunities here. It is hoped that resources

will soon permit coöperation also with other lines of work in the state, particularly commercial and industrial.

The courses listed for graduates are selected with the aim of providing such as will be intensive and extensive preparation in "pure" psychology. They are of a nature to be best fitted for those who wish to give themselves a thorough and sound purchase on psychology as their major subject as well as naturally to be recommended to students majoring in another department. The research work will ordinarily be done in connection with the course in experimental psychology.

Courses for Graduates and Advanced Undergraduates

Courses under this head may be taken by graduate students after consultation with the instructor and by special arrangement of the work.

20. Educational Psychology: General. To consider critically different topics such as original nature of man, heredity versus environment, kinds of learning and factors influencing learning, individual differences, mental hygiene, mental measurement. Texts, lectures, and experiments. Prerequisites, Psychology 1 and 2. *Fall Quarter.* Professor———.

22. Educational Psychology: the Psychology of Training. An analysis of human training: its nature, means, and possibilities. A reading survey will be made of the outstanding experimental work on these lines. The aim will be to get an accurate and scientific notion of the subject, with possibilities of application to various fields of applied psychology, including education and industry. Prerequisites, Psychology 1 and 2. *Spring Quarter.* Professor DASHIELL.

25. Genetic Psychology: Phyogenetic. Development of mind in the animal. Study of behavior as analyzable into tropisms, reflexes, instincts, habits, learning capacities, etc. Comparisons between different phyla of animals and between animals and man. Texts, lectures, and experiments. Prerequisites, Psychology 1 and 2. *Fall Quarter.* Professor DASHIELL.

26. Genetic Psychology: Ontogenetic. Development of mind in the child. Original motor and mental tendencies and their organization through development and training. Special attention to the development of instincts into conscious interests, and to the maturing of intellectual powers. Methods of measuring intelligence will be studied. Texts, lectures and experiments or observations. Prerequisites, Psychology 1 and 2. *Winter Quarter.* Professor DASHIELL.

30. Social Psychology. A brief survey of the subject from two different points of view: analysis of the social factors in individual mentality, as in the development of the Self, and analysis of the psychological factors involved in group phenomena. Attention also to be given to individual differences, race psychology, etc. Readings and lectures. Prerequisites, Psychology 1 and 2. *Fall Quarter.* Professor ————.

35. Commercial Psychology: Industrial. A survey of psychological aspects of industry and business, and of applications being made from the science of psychology to the latter. The attitude throughout to be

scientific and critical. Special needs of students of School of Commerce to be kept in mind. Readings and discussions. Prerequisites, Psychology 1 and 2 required, and Psychology 30 (Social) advised. *Winter Quarter.* Professor———.

36. Commercial Psychology: Advertising. An attempt is made to present systematically those aspects of psychology that will aid the advertiser more effectively to construct and present his advertisements. While aiming to give information of practical value the emphasis is placed upon the establishing of a point of view that will be of assistance in the development of a general technique on the part of the advertiser. Prerequisites, Psychology 1 and 2. *Spring Quarter.* Professor CRANE.

45. Abnormal Psychology: Feeble-mindedness. Presentation of the psycho-neural aspects of feeble-mindedness in general, and of the various types; together with their importance in relation to the problems of education, dependency, and delinquency. There will be discussion and demonstration of the various clinical methods of determination and classification of feeble-mindedness. Prerequisites, Psychology 1 and 2. *Winter Quarter.* Professor CRANE.

46. Abnormal Psychology: Psychoneuroses and Psychoses. A study is made of the more important deviations from the normally reacting and experiencing human organism. Attention is given to the sensory, imaginal, emotional, motor, etc., abnormalities and to the occurrence of these in the various psychoses. Brief surveys are given of the methods of clinical psychology and of psychotherapy. Prerequisites, Psychology 1 and 2. *Spring Quarter.* Professor CRANE.

Courses Primarily for Graduates

101-102-103. Experimental Psychology. Opportunity will be offered for the experimental investigation of special problems along the line of the individual student's interests. Where necessary, adjustment of the work to the needs of graduate students lacking laboratory training in this field can be made. *Fall, Winter and Spring Quarters.* Professors DASHIELL and CRANE.

105. Advanced General Psychology. An intensive study is made of the general field of psychology. Emphasis is placed upon the neural mechanism as a basis for understanding both the mental and reaction phenomena of psychology. *Fall Quarter.* Professor CRANE.

106. Contemporary Psychological Tendencies. A more or less systematic survey of the more outstanding recent and contemporary movements in modern psychology. Readings assigned in the works of Wundt and Titchener, James, Hall, McDougall and Stout, Thorndike, Pavlov, Watson, Cannon, Freud and Jung, and perhaps others. *Winter Quarter.* Professor DASHIELL.

108. Seminar. The general subjects will be chosen at the beginning of the quarter, and in view of the special interests of the students. The work will consist of papers by the members of the class, and free dis-

cussions. Opportunity will be given for the preliminary reporting of investigations students may have in progress and for helpful discussion thereof. *Spring Quarter.* Professors DASHIELL and CRANE.

DEPARTMENT OF ROMANCE LANGUAGES

WILLIAM MORTON DEY, OLIVER TOWLES, STURGIS ELLENO LEAVITT, Professors.
HOWARD RUSSELL HUSE, Assistant Professor.

The Department of Romance Languages offers advanced courses leading to the degree of master of arts. Its collection of books in the Romance Seminar Room in the University Library contains a fair amount of material for graduate courses in French and Spanish literature. A representative collection has recently been acquired and the department is receiving important scholarly journals form South America. In Old French philology and literature the facilities are increasing, especially in collections of texts. The library carries subscriptions for the leading journals devoted to Romance literature and philology, such as *Romania, Revue de Philologie Française, Zeitschrift für romanische philologie, Revue d'histoire littélaire de la France, Revista de filologia española, Revista contemporanea, Romanic Review, Revue hispanique, Modern Philology, etc.*

Requirements for the Degree of Master of Arts

The general requirements for the degree are stated elsewhere in this Bulletin. The special requirements in Romance Languages are as follows:

(a) A knowledge of Latin is required, and a reading knowledge of German is most desirable, as preparation for the graduate courses offered.

(b) Preliminary Courses. To become a candidate for the degree, the student must have passed satisfactorily courses 1-6 (see general catalogue of the University), and must have an acquaintance with the literature of the language specialized in equivalent to two courses from the group "Courses for Graduates and Advanced Undergraduates."

(c) Courses leading to the degree. Not less than nine courses must be taken in residence at this University, at least six of which must be in the field of Romance Languages.

FRENCH

Courses for Graduates and Advanced Undergraduates

11-12. French Literature of the Seventeenth Century. Classicism: Molière, Corneille, Racine; Boileau, La Fontaine; Prose Writers. Prerequisite, French 6. *Double Course. Fall and Winter Quarters.* Professor TOWLES.

13. French Literature of the Eighteenth Century. Voltaire, Montesquieu, Rousseau, les Encyclopédistes. A study of the literary movement of the century and of the origins of romanticism. Prerequisite, French 6. *Fall Quarter.* Professor HUSE.

15-16. The French Romantic Movement. Lamartine, Hugo, Vigny, Musset, etc. Later literary movements are also touched upon. Lectures, reading, reports. Prerequisite, French 6. *Double Course. Fall and Winter Quarters.* Professor DEY.

17-18. The French Drama. A study of the development of the drama in France. Lectures, reading, reports. Prerequisite, French 6. *Double Course. Winter and Spring Quarters.* Professor TOWLES.

19-20. The French Novel. A study of the development of the novel in France. Lectures, reading, reports. Prerequisite, French 6. *Double Course. Two Quarters.* (To be given in 1922-23 and in alternate years.) Professor DEY.

23-24. French Poetry. A study of French lyric verse, beginning with Villon. Prerequisite, French 6. *Double Course. Two Quarters.* Professor ———.

Courses Primarily for Graduates

101-102. Studies in Romanticism. Intensive study of one author. Topic for 1922-23: Alfred de Vigny. This course pre-supposes French 15-16. *Double Course. Winter and Spring Quarters.* Professor DEY.

103-104. The French Classic Drama. An intensive study of Corneille, Racine, and Molière. Investigation of sources, extensive collateral reading, with oral reports and a thesis. *Double Course. Two Quarters.* Professor TOWLES.

105-106. The Sixteenth Century. Origins of the Renaissance movement: Italian and French Humanism. The Reformation. Marot, Rabelais, Calvin, the Pléiade, Montaigne. *Double Course. Winter and Spring Quarters.* Professor TOWLES.

121-122-123. Old French. Reading of the oldest texts: La Chanson de Roland, Aucassin et Nicolette; Chrétien de Troyes. Lectures on French Phonology and Morphology. *One and a Half Courses. Three Quarters.* Professor———.

125. Provençal. A study of the ancient language and literature of Provence. The poetry of the Troubadours. *Spring Quarter.* Professor——.

131. Introduction to Linguistic Science. Phonetic alphabets. Special attention to the pronunciation of French. Vowel measurements. *Spring Quarter.* Professor DEY.

140. Research in a special field under the direction of a member of the department.

SPANISH

Courses for Graduates and Advanced Undergraduates

11-12. Spanish Drama of the *Siglo de Oro.* Earlier dramatists, representative plays of Lope de Vega, Tirso de Molina, Calderón, Ruiz de Alarcón, etc. Lectures and reports. Prerequisite, Spanish 6. *Double Course. Two Quarters.* (Given in 1921-1922 and in alternate years.) Professor LEAVITT.

19-20. The Development of the Spanish Novel. *Double Course. Fall and Winter Quarters.* (To be given in 1922-1923 and in alternate years.) Professor LEAVITT.

21. Modern Spanish Novelists. Consideration of present tendencies and intensive study of one representative author. *Spring Quarter.* (To be given in 1922-1923 and in alternate years.) Professor LEAVITT.

Courses Primarily for Graduates

121-122. Early Spanish. Ford's *Old Spanish Readings.* The Poem of the Cid. Spanish Literature to the Sixteenth Century. *Double Course. Fall and Winter Quarters.* Assistant Professor———.

123. Early Spanish Literature. Intensive study of one representative author of this period. Prerequisite, Spanish 121-122. *Spring Quarter.* Assistant Professor———.

131-132. Introduction to Spanish-American Literature. A study of notable authors and consideration of present-day writers. *Double Course. Two Quarters.* Professor LEAVITT.

140. Research in a special field under the direction of a member of the department.

DEPARTMENT OF RURAL SOCIAL SCIENCE

E. C. BRANSON, Professor.
S. H. HOBBS, JR., Assistant Professor.

1. The work offered to graduate students by the Department of Rural Social-Economics is a formal response on the part of the University to the state-wide demand for direct schooling in matters of competent citizenship and effective public service in rural areas. It concerns the problems of country wealth and welfare—the problems of 80 per cent of the population of North Carolina and the South. The activities of the department look two ways: into great fields of learning on the one hand, and on the other into concrete social situations—into the puzzles of life and livelihood in our country regions.

2. During the last seven years the graduate students registering for these courses have been (1) teachers who aspire to leadership in community affairs as well as teachership in community schoolhouses; (2) preachers of various religious faiths, who have widening visions of ministry in country and village pastorates, and (3) young men who have become aware of the steadily increasing demand for teachers of rural social science in the country high schools, the teacher-training schools, the land-grant colleges, and the church colleges and seminaries. Since the report of the Federal Country Life Commission in 1909 more than a hundred schools of liberal learning, technical arts, and professional training have established courses in rural economics and sociology, and the number increases daily.

3. The courses in rural social-economics offered by the University of North Carolina are in way of rapid development. Its graduate work

in this field responds sensitively (1) to the demands of the social workers created by the thirty-five public welfare laws recently passed by the legislature, and (2) to the rural economic and social research plans and policies that are now being developed by the Federal Department of Agriculture. The state experiment stations and agricultural colleges of the country are calling for trained research workers in rural fields, and for teachers of rural social science subjects. The state is calling for trained social organizers and field agents in a hundred counties. And they ought to be public servants with a competent grasp of social subjects and an effective grip upon social situations and problems.

The seminar room of the department is an extensive rural social science library. There is probably no better in the United States. It is well equipped with the rare literature of its special field of learning, with standard texts and reference volumes, current reports, bulletins, pamphlets, journals, magazine and newspaper clippings, and the like. It is also a clearing house of information about North Carolina, economic, social, and civic—rural, industrial, and urban.

Courses for Graduates and Advanced Undergraduates

13-14-15. Rural Economics. Research, seminars, and field investigations in (1) land economics—resources, values, ownership and tenancy, laws and policies; (2) farm organization and management—farm systems, farm finance, distribution of farm products and the farm income, coöperative farm enterprise; (3) country wealth and country institutions, country home comforts and conveniences, etc.; (4) state and county studies, economic, social and civic; county bulletins, etc. Required preliminary preparation: approved courses in general and agricultural economics. Lacking such preparation, collateral courses in these subjects must be taken in residence here. *Three Full Courses. Fall, Winter, and Spring Quarters.* Professor BRANSON.

17-18-19. Rural Social Problems. 1. Research, seminars, and field investigations of (1) rural institutions and agencies; (2) transportation and communication facilities in rural areas; (3) country mindedness and its sequences; (4) town and country interdependencies; (5) social disability in country areas, our public welfare laws and agencies; (6) social aspects of tenancy and illiteracy; (7) state and county studies, economic, social, and civic; county bulletins, etc. 2. Rural Social Surveys. Research, technic and field work. 3. Statistics. Interpretation and use. 4. Rural Social Engineering. (1) Country community studies; (2) Community organization, economic and social. (3) County government. (4) Country leadership, requisites and technic. Required preliminary preparation: Approved courses in general and rural sociology, lacking which, collateral courses in these subjects must be taken in residence here. *Three Full Courses. Fall, Winter, and Spring Quarters.* Professor BRANSON and HOBBS.

DEPARTMENT OF SOCIOLOGY

HOWARD W. ODUM and JESSE F. STEINER, Professors.
HAROLD D. MEYER, Associate Professor.

The work in sociology in the University is organized around the Department of Sociology and the School of Public Welfare. For complete announcement of all courses and details concerning the school, see the special bulletin of announcements issued in January.

The School of Public Welfare of the University of North Carolina was authorized by the board of trustees at their mid-year meeting in January, 1920, on the recommendation of President Harry Woodburn Chase. The recommendation was made with the needs both of the college and the extension service of the University in mind and with the thought that such a school of public welfare would be built up around the Department of Sociology. In his report to the trustees, President Chase said:

"Nothing is more clear than that, if the citizenship of state and nation is to grapple successfully with the ever more complex problems of modern democracy, if popular government is to work effectively in these confusing times, our educational system as a whole must stress as never before the instruction of our youth in matters of common weal. A knowledge of the fundamental laws of society, of what democracy really means and what its problems are, a spirit of social-mindedness which leads the individual to look beyond himself and to think of himself in relation to his community—these things are more and more requisite for good citizenship. The social sciences, including economics, history, government and sociology in its various aspects, must receive a new and more intense emphasis in the higher education of the future. North Carolina, feeling her way towards the solution of new social problems consequent upon the growing complexity of her life, with a new program of social legislation, needs, and will need, leaders well trained in the fundamentals of their task. The proposed school of public welfare should help train such leaders, should offer short courses for workers in service, and should, in coöperation with state and national agencies, render assistance to the cause of public health, to superintendents of public welfare, Red Cross workers, secretaries of chambers of commerce and boards of trade, to school systems in their social problems, to bureaus of community recreation—in short, it should both correlate and make distinctive additions to the contributions which the University can render to the development of the human wealth of North Carolina."

The General Plan of Work

In accordance, therefore, with the purposes of the school as set forth by the president and trustees of the University plans for effective organization were begun and tasks entered upon during the summer school of 1920. To meet the specific needs of the state and the University, and to some extent the South, a four-fold service was planned. The *first* emphasizes *instruction* in sociology and social problems, including teaching

in the College and University, extension teaching through the Bureau of Extension or outside communities, and through general instruction and promotion of citizenship. The *second* emphasizes *training for social work and community leadership,* with special reference to town, village and rural communities, and with special application to the state of North Carolina and the South. This division hopes to meet the very urgent demands of the state for trained men and women for its county superintendents of public welfare and other official positions and of many communities throughout the South for Red Cross secretaries and other community workers in the mill villages and elsewhere. The *third* aspect of the work emphasizes direct and indirect *community service,* or social engineering through avenues of community leaders, county superintendents of public welfare, local and district conferences, and community planning for leaders, industrial managers and others. The *fourth* aspect emphasizes *social research,* scientific inquiry, and *publication* of results estimated to be of value to the state, the University, and to the general field of public welfare and social progress. A *fifth* general purpose, kept constantly in the foreground, provides that the school maintain close and cordial coöperation with the State Department of Public Welfare, with other state departments of public service, with other departments and schools of the University, and with local and national voluntary agencies.

University Organization

In the classification of services, just described, it is important to keep in mind the larger two-fold nature of the work. Instruction in the college and University, together with research into social problems, constitute the primary function of the Department of Sociology; while training for professional social work, extension services, and assistance in coördinating and perfecting public services, mark the primary work of the School of Public Welfare as an integral administrative unit of the University. The work of the Department of Sociology is credited, as other departments of the college, in the School of Liberal Arts and other schools, and may be counted toward the several degrees. The graduate degrees given in the School of Public Welfare, with majors in sociology or social work, are granted through the Graduate School of the University, as are all other graduate degrees. The University believes that professional training for social work and community leadership will make substantial progress in the projection of the ideals of a university professional school into the practical programs of public welfare. These ideals include: A standard curriculum of permanent and administrative unity; a special faculty of trained teachers; a faculty of coöperating university professors; the large university faculties and influence; a group of students well prepared and possessing the personality and character for leadership; a program of field work which provides adequate training and contributes to community building; the support of an enthusiastic and informed constituency; cordial coöperation with departments of public service and with private enterprise;

the spirit of scientific and constructive work characteristic of the best educational statesmanship.

The Plan of Instruction

In planning the courses of instruction, two important considerations have been kept constantly in mind: The first is to provide the necessary courses, in social theory and applied sociology, for the student who wishes to major in sociology or to elect subjects from this department adequate for his purposes. The second consideration has in mind the necessary background, philosophy and technique prerequisite to the preparation for social work in the larger and more effective way. In the first group, courses consist largely of the study of the history and theory of society, together with special problems like immigration, social pathology, penology, the negro problem, statistics, and social research and seminars on special topics assigned to the student. Such courses may be elected by college students and counted toward other degrees, or they may be elected and coordinated with the special courses or the training for professional social work.

In the group of courses prepared especially for the training of social workers and community leaders the institutions and institutional modes of life are the centers around which are built the instruction and field work required of all who select this plan of preparation. The six fundamental institutional modes of life emphasized are: The home and family; the school and education; the church and religion; the state and government; industry and work; the community and association. No courses are offered in the field of religion and the church, but courses in philosophy may be elected if desired, and the place of the church is treated thoroughly in all courses in community organization and community work, as well as in courses dealing with social theory and organization. The plan of instruction, then, follows the divisions set forth below:

1. General Social Theory.
2. The Home and Family.
3. The Community and Association.
4. The State, Government, and Public Institutions.
5. The School and Education.
6. Industry and Work.
7. Methods of Organization and Administration.
8. Field Work.

In each of these divisions courses listed are correlated with other courses, both in the Department of Sociology and Rural Social-Economics and in the departments of economics, government, psychology and the schools of education and commerce. The courses tending more nearly to specialization in industrial management and industrial welfare will be strengthened as the demand increases to include a larger number from which to choose. In making plans for enrolling or electing courses the

student should make special inquiry to ascertain whether all courses listed are given during any specific year. The exact statement of term courses is given where possible, but the special needs of students, together with other considerations, make it advisable to allow some flexibility in arranging final schedules.

Courses for Graduates and Advanced Undergraduates

5. Negro Problems. A study of the race problems of the South, with consideration of the history, economic and social status, and future of the negro. Standards of measurement for race progress; race relationships; the specific problems of the here and now of Southern race relations. *Seminar Course. Fall Quarter.* Professor ODUM.

6. Problems of Immigration. The essential problems of immigration in this country—history and analysis of immigration, restriction, adaptation, Americanization. Special problems of immigration in relation to industrial and social unrest and development. *Winter Quarter.* Professor STEINER.

7. Problems of the Small Town and Mill Village. The romance of the small town, its place in the American commonwealth, relationship to this state, town planning, mill village, its social and industrial problems, special studies of selected towns. *Spring Quarter.* Professor ODUM.

8. Community Organization. The community as a unit of work, problems of modern community life, principles underlying community organization, experiments in methods of community organization, development and coördination of community activities illustrated by case records, problems of community leadership. *Fall Quarter.* Professor STEINER.

9. Community Organization. A continuation of Sociology 8 with special attention given to current examples and methods of community organization in this and other countries. *The Community Council. Winter or Spring Quarters.* Professor STEINER.

10. Municipal Administration and Sanitation. This course deals with some selected problems of municipal administration, with particular reference to their effect upon the public welfare. The matters considered cover a wide range of civic problems and the treatment must necessarily be limited to fundamental principles. The course is designed to meet the growing need felt by public officials in North Carolina to be informed as to the best methods to be applied in planning for the physical side of civic and community expansion. The various problems arising in the transition from rural to urban conditions will be particularly considered. The intention is not to turn out experts in any of the subjects considered. It is desired primarily to educate public officials in the complex matters pertaining to modern city administration; to enable them to plan wisely and intelligently for the growth of their community; to know what kind of information they need and where to find it; and to provide for the intelligent expenditure of public funds for maintenance and expansion. *Fall Quarter.* Professor SAVILLE.

11. The Family. Early forms of the family in primitive society; its historical development during Greek, Roman and mediæval periods. The modern family and its problems. *Fall Quarter.* Professor STEINER.

12. Crime and Its Social Treatment. Nature and causes of crime, evolution of modern methods of criminal procedure, administration of penal and reformatory institutions, programs for the social treatment of the criminal, the problems of juvenile delinquency. *Winter Quarter.* Professor STEINER.

13. Social Pathology. A study of the abnormal and pathological aspects of social life, problems of dependency and degeneracy and methods of care and treatment of dependent and defective classes. *Spring Quater* Professor STEINER.

14. Family Case Work. Discussion of the relation of the individual to the family and the family to the community. The technique of case work and its scientific approach, methods of investigation, interviewing, social evidence, sources, diagnosis, relief. *Fall and Winter Quarters.* Professor STEINER and Miss BRYANT.

15. Family Case Work. A continuation of sociology 14, with more intensive study of case records. *Winter Quarter.* Professor STEINER and Miss BRYANT.

20. The Principles of Field Work. The study and demonstration of field work as a standard laboratory course in social science. Fourteen hours a week required of all who major in community work. *Fall Quarter.* Professor MEYER.

21. Field Work and Community Surveys. Planning for community recreation. Special days, special programs for communities, map-drawing and surveys, community fairs. *Winter Quarter.* Professor MEYER.

24. The Philosophy of Play. A study of play instincts, the relation of play to physical growth, to mental, social and moral development, theories of play, social significance in modern times. To be taken with sociology 20, 21, and 22. *Winter Quarter.* Professor MEYER.

44. The Organization and Administration of Public Welfare. A study of the methods and organization of public welfare in the United States, state, city, county and national programs of public welfare; a standard state and county plan. *Spring Quarter.* Professor ODUM.

Courses Primarily for Graduates

121. The Principles of Sociology. A graduate seminar in the study of advanced social theory and research into some special social problem. *Fall Quarter.* Professor ODUM.

122. Educational Sociology. An advanced course in the study of scientific programs of social progress. Objective measurement of social influences and social groups. Research into some specific problem relating to one of the larger institutions. *Winter and Summer Quarters.* Professor ODUM.

123. Historical Sociology. A study of the leading social theorists and their contribution to human thought and welfare. Research into the theories of some selected writer. *Spring Quarter.* Professor ODUM.

124. Poverty and Relief. A research seminar on the social treatment of the dependent in society. One special topic selected for research, as the County Home. *Fall Quarter.* Professor STEINER.

125. National Agencies for Public Service. A graduate seminar in the study of state and national agencies, both public and private, for the administration of relief. *Winter Quarter.* Professor STEINER.

126. Community Organization. An advanced course following sociology eight. Intensive study of special movements and new theory and practice in community organization and leadership. *Spring Quarter.* Professor STEINER.

DEPARTMENT OF ZOOLOGY

HENRY VAN PETERS WILSON, Professor.

Those who find themselves strongly interested in zoology will meet with opportunities for teaching and investigating in several of the subdivisions of present-day universities, such as college, technological, medical, and graduate school. Others will find their best opportunity, especially if their interest centres round the fundamental problems of cellular biology, in research institutions of a more or less medical character. Museums need the service of many zoologists as curators. Such persons are expected to acquire intimate and extensive knowledge of the classification and natural history of some particular group. Somewhat the same kind of specialization is demanded of those who are drawn into institutions for the betterment of public health, some concentrating on the study of protozoa, others on the insects that spread disease, others on the parasitic worms, etc. There is, finally, much work of an economic nature that is carried on by zoologists in the service of national and state bureaus, such as the U. S. Bureau of Fisheries and the several bureaus under the U. S. Department of Agriculture.

The department occupies, along with the Department of Botany, the Biological Building known as Davie Hall, a description of which is contained in the University catalogue. The equipment of the department in books, journals, collections, and instruments will be found adequate to needs of much graduate work. Opportunity to carry on investigations at the seaside may usually be obtained during the summer at the Biological Station of the U. S. Bureau of Fisheries situated at Beaufort, N. C.

The courses listed below are such as lead more especially to the master's degrees (M.A. or M.S.). For the Ph.D. degree the essential requirement is that the candidate shall have such a grasp of the concepts and methods of zoology as will enable him independently to acquire knowledge of some importance that is new to science. This depends not only on manipulative skill and experience but also on ability to handle the literature of the subject, the treatises, hand-books, and especially the current journals. A reading knowledge of French and German is necessary.

Courses for Graduates and Advanced Undergraduates

3. Comparative Anatomy of Vertebrates. Dissection of types, especially amphioxus, petromyzon, fish, fowl, rabbit. Laboratory work with occasional lectures. *Fall Quarter.*

4. Comparative Embryology of Vertebrates. Maturation and fertilization phenomena in some invertebrate types; segmentation and formation of germ layers in frog and teleost fish; germ layers and development of characteristic vertebrate organs in chick; fundamentals of microscopic technique. Laboratory work with occasional lectures. *Winter Quarter.*

5. Comparative Histology of Vertebrates. Microscopic preparation of selected tissues and organs are made from the fresh animal, and studied with the help of texts. Laboratory work with assigned reading. Prerequisite, Zoology 4. *Spring Quarter.*

6-7-8. Morphology and Classification of the Invertebrates. Dissection and microscopic study of types of the chief orders, with some consideration of life-histories; systematic diagnosis. Laboratory work with occasional lectures. *One and a Half Courses. Fall, Winter and Spring Quarters.*

Courses Primarily for Graduates

109-110-111. Embryology and Regeneration in the lower metazoa and simpler vertebrates. *Triple Course.* (Work of any quarter may be extended beyond this limit.) *Fall, Winter and Spring Quarters.*

112. Research under direction. Designed especially for candidates for the master's degree. *Whole or Half Course. Spring Quarter.*

REGISTER OF STUDENTS, 1921-1922

UNIVERSITY TEACHING FELLOWS

BOTANY: John Nathaniel Couch.

CHEMISTRY: Richard Arthur Lineberry, Frederick Phillips Brooks, Horace Crockford, Ernest William Constable.

CIVIL ENGINEERING: Roy Jay Morton.

ECONOMICS: Franklin Thompson.

EDUCATION: Levi Haywood Jobe.

ELECTRICAL ENGINEERING: George Wallace Smith.

ENGLISH: Edwin Samuel Lindsey, Paul Greene, A. Theodore Johnson, Raymond William Adams.

GEOLOGY: Henry Spurgeon Boyce, Burgin Edison Lohr.

HISTORY AND GOVERNMENT: Fletcher Melvin Green, Tyre Crumpler Taylor, Miles Hoffman Wolff.

MATHEMATICS: Francis Bacon.

PSYCHOLOGY: William Darby Glenn, John Holman McFadden.

PUBLIC WELFARE: James Allen Dickey.

STUDENTS

[NOTE: No distinction is made in this list between admission to the Graduate School and admission to candidacy for a degree. The symbol "s" indicates registration for the summer term.]

ADAMS, RAYMOND WILLIAM.....Elgin, Ill.
A.B., Beloit College (Wis.) 1920. *English*
M.A., University.
N. C., 1921. Second Year. Fellow in English.

ALEXANDER, CLAYTON BROWN.....Matthews
A.B., Davidson, 1919. First year. *History, Economics*

ALEXANDER, MATILDA.....Creswell
A.B., Western Maryland, 1919. Second year. *English*

AMICK, HAROLD CLYDE.....Burlington
A.B., Elon, 1920. Second year. *Civil Engineering*

ANDERSON, ROY KITTER.....London, Tenn.
A.B., Maryville College, 1918. Second year. *Education, Sociology*
s, 1920, 1921.

ANDREWS, NITA.....Chapel Hill
A.B., N. C. College for Women, 1919. S. 1921. *Education*

ANSCOMBE, FRANCIS CHARLES.....Guilford College
A.B., Guilford, 1920. s, 1921. *History*

ATKINSON, MINNIE.....Mullins, S. C.
A.B., Elon, 1919. s, 1921. *Education, English*

BAILEY, HERBERT VICTOR.....Neuse
A.B., 1916. s, 1917. Third year. s, 1920, 1921. *Education*

BARNES, WILLIAM BRADLEY.....Wilson
A.B., 1917. First year. s, 1921. *Education, History*

BARRINGTON, SYBIL.....Raleigh
A.B., N. C. College for Women, 1920. s, 1921.

BEERS, CHARLES DALE.....Asheville
A.B., 1921. First year. *Zoology*

BLOUNT, WILLIAM AUGUSTUS.....Washington
A.B., 1920. First year. *History, English*

BOWN, JOSEPH ROBERT.....Woodland
A.B., Guilford, 1915. s, 1921. *Education, Sociology*

BOYCE, HENRY SPURGEON.....Tyner
A.B., 1921. First year. Fellow in Geology. *Geology, Chemistry*

BRADLEY, JOHN HODGDON, JR.....Dubuque, Iowa
A.B., Harvard, 1921. First year. s, 1921. *Geology*

BRADSHAW, FRANCIS FOSTER.....Chapel Hill
A.B., 1916. Second year. *Philosophy*

BROCK, SARAH LEE.....Richland
A.B., Greensboro College for Women, 1917. *Rural Social Science*
Second year. s, 1920-1921.

BROOKS, FREDERICK PHILLIPS.....Kinston
B.S., 1921. First year. Fellow in Chemistry. *Chemistry*

CARMICHAEL, WILLIAM DONALD, JR.....Durham
B.S., Com., 1921. First year. *Economics, Psychology*

CASEY, LUBY R.....Goldsboro
A.B., Guilford, 1920. First year. s, 1921. *Education*

CATES, CLYDE LUCIUS.....Wadesboro
A.B., 1912. s, 1916, 1917, 1920, 1921. Fourth year. *Education, English*

CAVINESS, MYRTLE.....Grifton
A.B., Greensboro College for Women, 1918. *English, French*
s, 1919, 1920, 1921. Third year.

COBB, LUCY MARIA.....Chapel Hill
A.B., 1921. s, 1921. *Education*

COBB, MARY LOUISA.....Chapel Hill
A.B., 1921. First year. *English, Education*

CONSTABLE, ERNEST WILLIAM.....Lake Landing
B.S., 1921. State College. First year. s, 1921. *Chemistry*
Fellow in Chemistry

COUCH, JOHN NATHANIEL.....Chapel Hill
A.B., 1919. Second year. Fellow in Botany. *Botany, Zoology*

COXE, FRANK.....Asheville
A.B.,Yale, 1921. First year. *Economics, History*

CRAIG, MARJORIE.....Leaksville
A.B., N. C. College for Women, 1919. s, 1921. *English, Education*

CRAYTON, KATHERINE.....Oakboro
A.B., N. C. College for Women, 1919. s, 1921. *Education, English*

CREDLE, CLEMENT GIBBON.....Oxford
A.B., 1909. s, 1921. *Education*

CRISSMAN, CURTIS.....Chapel Hill
A.B., 1918. s, 1921. *Education*

CROCKFORD, HORACE ..... Chapel Hill
B.S., State College, 1920. First year. s, 1921. *Chemistry*
Fellow in chemistry.

DANIELS, JONATHAN WORTH ..... Raleigh
A.B., 1921. First year. *English*

DAUGHERTY, JOHN FENTON ..... Baltimore, Md.
A.B., Dickinson College, 1921. First year. *Mathematics*

DAVIS, CHARLES WALKER ..... Burlington
A.B., 1919. First year. *Education, Sociology*

DAVIS, JAMES BLAINE ..... Chapel Hill
A.B., Mars Hill College, 1909. Third year. *English*

DICKEY, JAMES ALLEN ..... Elon College
A.B., Elon, 1912. First year. *Sociology*
Fellow in Public Welfare.

DOFFLENGER, DEWEY HOBSON ..... Burlington
A.B., Elon, 1920. First year. *Education, History*

EDNEY, CALVIN RANSOME ..... Mars Hill
A.B., 1917. First year. *History*

ELDRIDGE, JOHN G. ..... Bentonville
A.B., 1920. Second year. *Chemistry*

ENSINGER, MRS. ANNIE BENNETT ..... Chapel Hill
A.B., Oberlin, 1898. s, 1921. *Education*

EVANS, WILLIETTA ..... Tyner
A.B., Trinity 1915. s, 1921. *English*

GILES, ISAAC VILES ..... Marion
B.S., 1919. M.S., 1920. Third year. *Chemistry, Physics*

GLENN, WILLIAM DARBY ..... York, S. C.
A.B., 1921. First year. *Psychology, German*
Fellow in Psychology

GRANT, DANIEL LINDSEY ..... Snead's Ferry
A.B., 1921. First year. *History, Economics*

GREEN, FLETCHER MELVIN ..... Gainesville, Ga.
B.Ph., Emory University, 1920. First year. *History*
Fellow in History.

GREENE, PAUL ..... Lillington
A.B., 1921. First year. *English*
Fellow in English.

HAMILTON, THOMAS HOFFMAN ..... Chapel Hill
A.B., Monmouth College (III), 1907. *English*
Second year.

HARMON, ANNIE OLIVIA ..... Pittsboro
A.B., Meridian College, 1920. *English, History*
s, 1921.

HARMON, MINNIE ETTA ..... Tazewell, Va.
A.B., Lynchburg College, 1914. First year. *Sociology*

HARRELL, WILLIAM BURRUS ..... Chapel Hill
B.S., Com., 1921. First year. *Economics*

HATCHER, JOHN THOMAS ..... Calypso
A.B., 1914. Third year. *Education, English*

HATHCOCK, JAMES SHOFFNER.....Norwood
B.S., 1919. State College. s, 1920, 1921. *Education, Sociology*

HEFFNER, HUBERT CROUZE.....Maiden
A.B., 1921. First year. *English, Philosophy*

HELMS, HENRY ARTHUR.....Indian Trail
A.B., 1920, Wake Forest. s, 1920, 1921. *Education*

HENRY, HOMER.....Sylva
A.B., Emory and Henry, 1915. *Education, Rural Economics*
s, 1920, 1921.

HIGHSMITH, EDWIN MCCOY.....Raleigh
A.B., 1907. Second year. *School Administration*

HILL, MICHAEL ARENDELL.....Beaufort
A.B., 1920. Second year. *Mathematics, Civil Engineering*

HINSHAW, CLIFFORD.....Gatesville
A.B., Guilford, 1916. s, 1920, 1921. *Education, Sociology*

HOFFNER, BENJAMIN IVEY.....Salisbury
A.B., 1921. s, 1921. *Mathematics, Education*

HOWELL, ALMONTE.....Chapel Hill
A.B., Denison University (Ohio), 1917. *English*
M.A., Columbia, 1920. Second year.

HUFF, HUBERT HENRY.....Soudan
A.B., 1917. s, 1921. *Education*

HUITT, ROBERT.....Newton
A.B., 1920, Lenoir College. s, 1921. *Education, Sociology*

JAMES, MURRAY GIBSON.....Maple Hill
B.S., N. C. State, 1918. s, 1921. *Education, Economics*

JENKINS, EDGAR BRYAN.....Chapel Hill
A.B., 1919. s, 1920, 1921. *English*

JOBE, LEVI HAYWOOD.....Mebane
A.B., 1918; Fellow in Education. Second year. *Education, English*

JOHNSON, A. THEODORE.....Asheville
A.B., Westminster College, (Mo.), 1914; M.A., University *English*
Virginia, 1917; First year. Fellow in English.

JOHNSON, BESSIE FRANK.....Delway
A.B., Meredith, 1913. s, 1921. *English, Education*

JONES, JOHN CLYDE.....Wingate
A.B., Wake Forest College, 1915. s, 1921. *Education, Sociology*

JOYNER, ELISHA WILEY.....Hertford
A.B., 1913. s, 1920, s, 1921. *Education, English*

KELLUM, ISAAC JAMES.....Kellum
A.B., Elon, 1915. s, 1919, 1920, 1921. *Education, Sociology*

KISER, ROGER CLINTON.....King
A.B., Guilford, 1919. s, 1921. *Education*

LASSITER, JAMES HORACE.....Rich Square
A.B., 1920. s, 1920, 1921. *Education, Sociology*

LATSHAW, HARRY FRANKLIN.....Chapel Hill
A.B., 1920; M.A., 1921. Second year. *Psychology, Education*
Instructor in Latin.

LAY, ELIZABETH ATKINSON.....Beaufort
A.B., 1919. Third year. *English*

LEDFORD, ROBERT NEWTON.....Hot Springs
A.B., 1921. Second year. *Education*

LEEPER, MAMIE BRIGHT.....Belmont
A.B., N. C. College for Women, 1919. s, 1921. *Education*

LENTZ, ADA LILLIAN.....Gold Hill
B.S., N. C. College for Women, 1914. *Education*

LEONARD, EDWARD CHARLES.....Burlington
A.B., Earlham College (Ind.), 1913. s, 1921. *Geology*

LEWIS, MARGARET MAY.....Scotland Neck
A.B., Meredith, 1904. s, 1920, 1921. *Education*

LINDSAY, EDWIN SAMUEL.....Tryon
A.B., 1919; M.A., 1921. Third year. *English*
Fellow in English.

LINEBERRY, RICHARD.....Siler City
B.S., Guilford College, 1919. First year. *Chemistry*
Fellow in Chemistry.

LITTLE, THOMAS.....Charlotte
A.B., Washington (Miss.) College, 1915. First year. *Sociology, Education*

LOFTIN, EMILY LOUISE.....Beaufort
A.B., Trinity College, 1919. s, 1921. *Education, English*

LOHR, BURGIN EDISON.....Lincolnton
A.B., 1921. First year. *Geology, Chemistry*
Fellow in Geology.

LONG, JOHN OGLESBY.....Carrboro
A.B., Trinity, 1921. First year. *Education*

MCCANLESS, WALTER FREDERICK.....Wadesboro
Ph.B., 1904. First year. *English*

MCCLAMROCH, ROLAND PRINCE.....Greensboro
A.B., 1917. Second year. *English*

MCFADDEN, JOHN HOLMAN.....Jacksonville, Fla.
A.B., Emory University, 1921. First year. *Psychology, Sociology*
Fellow in Psychology.

MCIVER, LULA MARTIN.....Greensboro
A.B., N. C. College for Women, 1921. First year. *English*

MCKEE, JESSIE.....Belmont
A.B., N. C. College for Women, 1918. s, 1921. *English*

MCMAHON, WILLIAM HAMPTON.....Winston-Salem
A.B., Trinity College, 1914. s, 1920, 1921. *Education*

MACKAY, EUNICE STACY.....Dunn
B.S., Flora McDonald, 1901. s, 1921. *English, Education*

MACMILLAN, WILLIAM DOUGALD.....Wilmington
A.B., 1918; A.M., 1920. Third year. *English*
Instructor in English.

MARTIN, ELBERT HOKE.....Charlotte
A.B., 1921. s, 1921. *Education, History*

MILLSAPS, VERA EVANNA.....Statesville
B.S., N. C. College for Women, 1915. s, 1921. *Education, Chemistry*

MOCK, HENRY BASCOM.....Lewisville
A.B., 1917. s, 1920, 1921. *English*

MOORE, JOSEPHINE ALSEY.....Greensboro
A.B., N. C. College for Women. s, 1921. *Psychology, English*

MORROW, ADELAIDE ..... Mebane
B.P., N. C. College for Women, 1911. s, 1921. *English*

MORTON, ROY JAY ..... Jacksonville
A.B., Elon, 1920. Second year. *Civil Engineering*
Fellow in Civil Engineering.

MOSS, CORA JENKINS ..... Franklinton
A.B., Trinity College, 1918. *English, Education*
First year. s, 1921.

NAIMAN, BARNETTE ..... Greensboro
B.S., 1921. First year. *Chemistry*
Ledoux fellow in Chemistry.

NEAL, NAOMI ..... Marion, S. C.
A.B., N. C. College for Women, 1918. First year. *Chemistry, Zoology*

NEWTON, GILES YEOMANS ..... Gibson
A.B., Trinity, 1916. Fourth Summer. *Education, French*

NICHOLS, LEE BURRUS ..... Sparta
A.B., Davidson, 1920. *Education, English*
s, 1920, 1921.

NICHOLSON, WILBURN AVERY ..... Woodleaf
B.D., Union Theological Seminary *Education, Sociology*
(Richmond, Va.). s, 1921.

NIMS, FREDERICK BOYDEN ..... Mount Holly
A.B., 1917. s, 1921. *Latin, English*

NORTON, JOHN WILLIAM ROY ..... Laurel Hill
A.B., Trinity, 1920. s, 1921. *Education*

ODUM, ANNA ..... Chapel Hill
A.B., Peabody College (Tenn.). *Sociology, Psychology*
A.M., Clark University. First year.

OVERCASH, JAMES OLIVER ..... Statesville
A.B., 1913. s, 1921. *Education*

PAULL, NORMAN ..... Fairham, Mass.
A.B., Worcester Polytechnic, 1893. First year. *Economics*
Assistant Professor Mathematics.

PEARSON, EARL WHITTIER ..... Dudley
A.B., Guilford, 1914. s, 1921. *Education, Sociology*

PEGG, HERBERT DALE ..... Guilford College
A.B., 1915. Wake Forest, LL.B., 1916. *Education, History*
Third Summer.

PERRY, THOMAS GRAY ..... Wilkesboro
A.B., Guilford, 1916. s, 1921. *Education, English*

PICKENS, WYLIE MILLER ..... Warrenton
A.B., Trinity, 1916. s, 1921. *Education, English*

POWELL, THOMAS EDWARD ..... Warren Plains
A.B., Elon, 1919. s, 1921. *Geology, Zoology*

RANES, ARTHUR ..... Raleigh
A.B., Wake Forest, 1908. Fourth summer. *Education*

RAPER, ANNIE LINDSAY ..... Linwood
A.B., Elon, 1915. s, 1921. *Education, English*

REEP, ALFRED RAY ..... Gastonia
A.B., Trinity, 1917. Second summer. *Education*

RENEGAR, HARVEY CALDWELL ..... Harrer
A.B., 1921. s, 1921. *Education, History*

REYNOLDS, BRUCE DODSON.....Long Island, Va.
B.S., University of Virginia, 1920. s, 1921. *Education*

RHODES, GEORGE WASHINGTON.....Newport
A.B., 1911. s, 1921. *English, Education*

ROBINSON, MELVIN.....Atlantic
A.B., 1914. s, 1921. *English, Education*

ROGERS, WILLIAM WHITE.....Timberlake
A.B., 1912. Second summer. *Psychology, English*

ROSS, LOUISE.....Brooklyn, N. Y.
A.B., Hunter College, 1919. s, 1921. *Education*

SAWYER, GEORGE LIPPARD.....Gastonia
A.B., Lenoir College, 1915. Fourth summer. *Education, History*

SHORT, GEORGE ASA.....Wilson
A.B., Guilford, 1913. Third summer. *Education, Rural Economics*

SIMPSON, HENRY BELK.....Matthews
A.B., 1920. s, 1921. *Education, Psychology*

SISK, RUBY J.....Franklin
A.B., N. C. College for Women, 1919. s, 1921. *Education*

SLEDD, ARTHUR PUREFOY.....Wake Forest
B.S., Wake Forest, 1916. *Organic Chemistry, Bacteriology*
A.M., 1918. First year.

SMITH, GEORGE WALLACE.....Wilmington
A.B., University of North Carolina, 1916. First year. *Electrical Engineering*
Fellow in Electrical Engineering.

SMITH, JUNIUS EVERETT.....Chapel Hill
A.B. Wake Forest, 1914. Third summer. *Education, History*

SMITH, SAMUEL CLEMENT.....Chapel Hill
A.B., Guilford, 1918. Third summer. *Chemistry, Physics*

SMITHDEAL, EDWARD.....Advance
A.B., Trinity, 1902. Second summer. *Education, Psychology*

SNODDY, CHARLES EDISON.....Mt. Airy
A.B., 1917. Second summer. *English*

SPENCER, ROBERT BAXTER.....Hobucken
A.B., 1920. Third summer. *Education*

SPRINKLE, THOMAS WEAVER.....Reidsville
A.B., Trinity, 1916. Second summer. *Education, Sociology*

SPRUILL, MARY JAMES.....Littleton
A.B., 1921. First year. *English*

STOUT, WILBUR WHITE.....Burlington
A.B., 1921. First year. *English, Composition, Literature*

STUART, LYNDON.....Snow Camp
A.B., Guilford, 1917. Second summer. *Education*

STURDIVANT, MRS. J. JOANNA.....Carrboro
A.B., Carson-Newman, 1909. First year. *Sociology, Education*

SYKES, PAUL SCARBORO.....Woodland
A.B., Wake Forest, 1917. Third summer. *Education, English*

TAYLOR, HAYWOOD MAURICE.....Tarboro
B.S., 1920. M.S., 1921. Second year. *Chemistry, Physics*
Instructor in Chemistry, 1921.

TAYLOR, MAGGIE ..... Nebox
A.B., Elon, 1919. First year. *Education, English*

TAYLOR, TYRE CRUMPLER ..... Sparta
A.B., 1921. First year. Fellow in History. *History, Government*

TEAGUE, EVERETT ..... Taylorsville
A.B., 1920. First year. *Education, Sociology*

TERRY, JOHN SKALLY ..... Rockingham
A.B., 1918. First year. s, 1920, 1921. *English*

THOMAS, CYRUS BERKLEY ..... Jonesboro
A.B., 1921. First year. *Education*

THOMAS, H. LEE ..... Broadway
A.B., Elon, 1917. First year. *Education, Sociology*

THOMPSON, FRANKLIN ..... Jacksonville
A.B., 1921. First year. Fellow in Economics. *Economics*

TOTTEN, HENRY ROLAND ..... Chapel Hill
A.B., 1913. A.M., 1914. Fourth year. *Botany, Zoology, Geology*
Instructor in Botany.

TRUITT, JAMES SPENCER ..... Sanford
A.B., Elon, 1912. s, 1921. *Education*

VANLINDINGHAM, HARRY SYLVANUS ..... West Point, Miss.
B.A., Virginia College, 1912. M.A., 1916, *Italian*
University of Grenoble, 1919-20. University the
Sorbonne, 1920-21. First year

WALKUP, BESS ..... Renick, W. Va.
A.B., Randolph-Macon Woman's College, *Education, Sociology*
1920. s, 1921.

WEATHERLY, CARL HOLMES ..... Kernersville
B.S., Davidson, 1905. s, 1921. *Education, History*

WEATHERS, CARL HOLMES ..... Kernersville
B.S., Davidson, 1905. Third summer. *Education, History*

WEINSTEIN, VITA ..... Brooklyn, N. Y.
A.B., Hunter College (N. Y.), 1920. s, 1921. *Education*

WHITENER, RUSSEL WINFIELD ..... Hickory
A.B., Catawba College, 1917. Third summer. *Education, History*

WILLIAMS, SUE VERNON ..... Asheville
A.B., Randolph-Macon, 1919. *Sociology, History*
Second summer.

WILSON, THOMAS JAMES, III ..... Chapel Hill
A.B., 1921. First year. *French*

WILSON, THOMAS ..... Rural Hall
B.S., Com., 1921. First year. *Economics*

WOLFF, MILES HOFFMAN ..... Concord
A.B., Roanoke College (Va.), 1920. First year. *History*
Fellow in History.

WOODARD, CLEMENT MANLY ..... Florence, S. C.
A.B., 1918. First year. *Education, Sociology*

WOOSLEY, JOHN BROOKS ..... Chapel Hill
A.B., Gilford, 1912. M.A., Haverford, 1914. *Economics*

YOUNG, INA V. ..... East Durham
A.B., Trinity, 1917. Third summer. *Education, Sociology*